

# PILLARS

We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment | MAY 2017

## ESCALATING MATTERS

BCA GALLERY  
REOPENS

NURTURING GREEN  
ADVOCATES

## ON TO NEW CHALLENGES

DR JOHN KEUNG  
REMINISCES ABOUT HIS  
TIME AS BCA CEO  
AS HE TRANSITIONS TO  
BECOME DEAN OF  
BCA ACADEMY

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### DEAR READERS,

There's a saying that goes, "You cannot control what happens to you, but you can control your attitude toward it, and by doing so, you will be mastering change rather than allowing it to master you." This issue, we shine the spotlight on the Lift and Escalator (L&E) sector by profiling two young men, Loh Ashley and Muhammad Faizal, who were recipients of the BCA-Industry scholarships and are now thriving in this field. They chose to take control of their own future by tapping on opportunities during uncertain times. We need more of such young blood to join the L&E sector.

To continue building a robust manpower pool for this sector, BCA has also set up the Lift and Escalator Sectoral Tripartite Committee — consisting of representatives from the Government, industry associations and firms — which will look into the sector's manpower requirements and beyond.

We also recently opened the new and bigger BCA Gallery after a year-long revamp. Located at BCA Academy, it is one of our outreach platforms to raise public awareness on the built environment sector. The new gallery incorporates content that is geared towards the young, including a multimedia interactive exhibit that lets them become Temporary Occupation Permit (TOP) Inspectors, and a profiling quiz to discover which built environment career best suits them.

I am proud to share with all of you that BCA's Back to School programme clinched the Gold award from the Asia-Pacific Economic Cooperation Energy Smart Communities Initiative (APEC ESCI). It was designed to groom the next generation of green-collar workforce by getting student alumni to be involved in greening their alma maters. We are heartened to be recognised for our efforts in inculcating interest in environmental sustainability among the youths, who are the future of our industry.

This year marks a significant milestone for me after 11 years at the helm of BCA. I will be stepping down as CEO of BCA and passing the baton to Mr Hugh Lim, who brings with him a wealth of experience in operations and policy. I would like to put on record my appreciation for all the strong support I have received from colleagues and industry stakeholders over the years. In this issue, I will share more on how I will continue contributing as Dean of the BCA Academy and Chairman of the BCA Centre for Sustainable Buildings.

Let's continue to forge new frontiers and break new ground for our built environment together!

**Dr John Keung**  
*Chief Executive Officer*



# ESCALATING MATTERS

*Meet two young men who are happily settling into their careers as technicians in the Lift and Escalator sector.*

There are more than 2,000 technicians taking care of an estimated 63,000 lifts and 6,000 escalators in Singapore. With more high-rise buildings expected to be built in the near future, it is vital that the Lift and Escalator sector develops strategies to retain local talent while attracting new blood.

Two local talents who have risen to the challenge are Loh Ashley and Muhammad Faizal. Since their graduation, these two ITE scholars have been working with lift firms Joven Engineering Pte Ltd and Hin Chong Engineering Construction Pte Ltd respectively. *Pillars* finds out how they are faring in their careers.

#### **Loh Ashley Mohamed Fattah, 25**

- BCA-Joven Built Environment ITE Scholar
- NITEC, Facility Technology (Vertical Transportation), ITE College East

It took him a while, but Ashley has finally found a niche in which to establish himself: the Lift and Escalator sector.

He began his working life in the cleaning sector, then switched to a series of sales jobs. Influenced by a cousin who was in the Lift and Escalator sector, Ashley then



decided to enrol in ITE's Vertical Transportation course, and became fascinated with various components of lift systems, as well as the many ways to troubleshoot lift faults. His dedication earned him a spot as an intern with Joven Engineering, a lift installation company.

His internship was an invaluable journey that prepared him for the working world. "I had many questions on the preparation work and procedures in lift installations, which my colleagues answered patiently," he shares. "I am fortunate to have their care and friendship, which helped me a lot in my everyday learning."

Thanks to his sterling stint at Joven, the company — through the BCA-Industry Built Environment ITE Scholarship — offered to co-sponsor his studies, and guarantee him a full-time position upon graduation. It was an opportunity he grabbed without hesitation.

Ashley feels fortunate to be in a fulfilling profession, which is why he is keen to pay it forward. "I feel



I hope to become a competent lift specialist who can guide and mentor other people who share the same passion as I do.



Loh Ashley Mohamed Fattah, 25



#### **Muhammad Faizal bin Khairum, 23**

- BCA-Hin Chong Built Environment ITE Scholar
- NITEC, Electrical Technology (Power and Control), ITE College East



Like Ashley, Faizal was inspired by a relative — an older brother — to enter the Lift and Escalator sector.

Good with his hands, Faizal enjoyed his time studying electrical engineering in ITE, but became

interested in becoming a lift technician after observing and chatting with his elder sibling, who was already working as one.

Qualifying for the BCA-Industry Built Environment ITE Scholarship programme, Faizal earned an opportunity to follow his dream

when Hin Chong Engineering Construction Pte Ltd offered to not only co-sponsor his scholarship, but also employ him upon graduation. Not surprisingly, Faizal accepted the offer to follow in his brother's footsteps.

After a year in his new post, Faizal reports that he has no regrets taking the job. "I enjoy learning about the modern lifts systems and keeping myself updated with the latest technology," he affirms. "Many of the skills are also applicable to other electrical systems in the building, helping me to better appreciate the overall facility management."

**Above: BCA-Industry Built Environment ITE Scholarship Award Ceremony 2017. Loh Ashley and Muhammad Faizal were two recipients of this scholarship. The ceremony, which took place in February this year, saw then-Senior Minister of State for Home Affairs and National Development Mr Desmond Lee handing out a total of 108 scholarships.**



Many of the skills are also applicable to other electrical systems in the building, helping me to better appreciate the overall facility management.



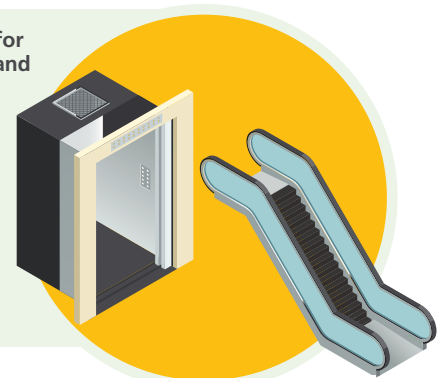
Muhammad Faizal bin Khairum, 23

## LIFT AND ESCALATOR SECTORAL TRIPARTITE COMMITTEE

Comprising representatives from the Government, industry associations and firms, as well as trade unions, this committee has been tasked to:

- develop a clear pathway for career progression in the Lift and Escalator sector, including mapping out wages and skills at different levels
- develop a training framework, including identifying

- qualifications for new entrants and the continual training requirements for existing workers
- look into ways to improve the image of the sector and its professions



# THE ROAD TO PRODUCTIVITY

*BCA's Second Construction Productivity Roadmap was discussed and passed during this year's Budget debate. Here are the milestones to be met.*

**During the Government's Budget 2017 debate for the Ministry of National Development, it was agreed that construction firms will receive more support from the Government to improve their productivity and explore growth opportunities.**

This support is closely guided by BCA's First and Second Construction Productivity Roadmaps, which aim to build a highly integrated and technologically advanced built environment sector led by progressive firms and supported by a skilled and competent workforce.

**First roadmap: taking stock**

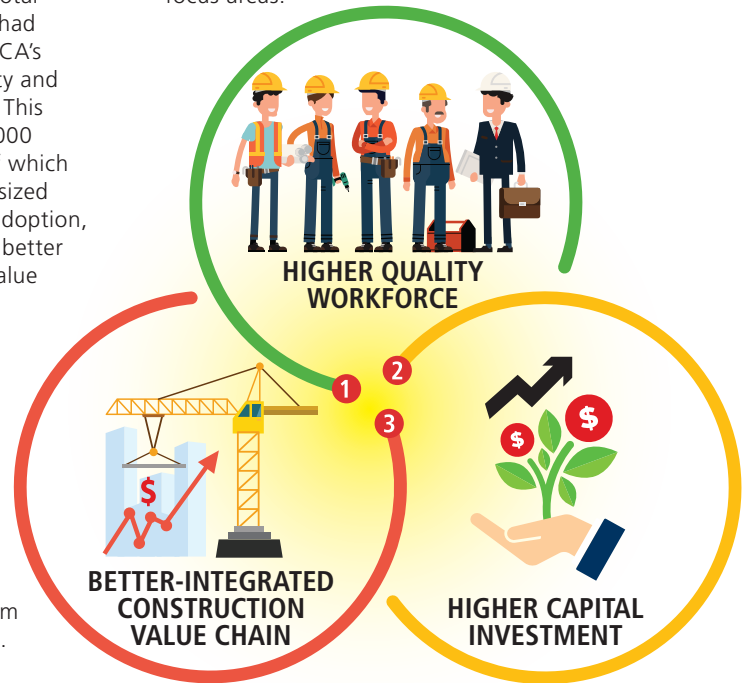
Since the first roadmap was implemented in 2011, annual site productivity — defined as the amount of floor area completed per man-day — has improved from 0.3% in 2010 to about 2% from 2014 to 2016.

At the close of 2016, around S\$450 million out of a total of about S\$800 million had been committed from BCA's Construction Productivity and Capability Fund (CPCF). This benefited more than 9,000 firms — around 90% of which are small- and medium-sized firms — in technology adoption, skills development, and better integration across the value chain.

**Second roadmap: towards 2020**

The second roadmap plans to aggressively drive up productivity gains by 2020. To support initiatives in this roadmap, S\$450 million from the CPCF has been earmarked from June 2015 to May 2018.

These initiatives fall under three focus areas:



**FROM 1 JANUARY 2017**

**10%**  
The percentage of workers needed to be Higher Skilled (R1) level

**Skills upgrading**

**Co-funding the upgrading of workforce**

**1 HIGHER QUALITY WORKFORCE**  
For now, about 40% of construction workers are at the Higher Skilled (R1) level — it was 20% in 2014, and only about 2% in 2011. To increase the proportion of higher-skilled workers, the following steps will be implemented under the second roadmap:

- Requiring minimum proportion of R1 workers. (From 1 January 2017, construction firms will be required to have at least 10% of their workers at the R1 level; BCA will consult the industry to review the minimum R1 requirement at the firm level.)
- Introducing multiple pathways for upgrading Basic Skilled (R2) workers to R1 workers.
- Granting lower foreign worker levy rates for R1 workers.
- Co-funding the upgrading of workforce at PMET and worker level.
- Equipping students and industry practitioners with future skills, such as Design for Manufacturing and Assembly (DfMA) through training courses.

## HIGHER CAPITAL INVESTMENT



### 2 HIGHER CAPITAL INVESTMENT

To achieve the productivity targets that the second roadmap is aiming for, there has to be widespread adoption of the Design for Manufacturing and Assembly (DfMA) concept, which proposes designing for labour-efficient construction, with as much construction work done off-site as possible.

Below is a summary of the key measures to be taken:

- Public and private sector projects will be subject to the same industry-wide standardisation; they will also be encouraged to use productive technologies and prefabricated components.
- Public sector to continue to take the lead in DfMA adoption

under the Productivity Gateway Framework (PGF), where public agencies formulate and implement their own productivity roadmaps. A \$150 million Public Sector Construction Productivity Fund (PSCPF) has also been set aside to further spur the adoption of productive and innovative solutions in public sector projects.

- Include the adoption of productive technologies under the Government Land Sales (GLS) and industrial GLS (iGLS) programmes. Moving forward, we are exploring the likelihood of launching a pilot GLS site that gives developers the flexibility to propose the most suitable technologies to adopt for the site.
- Provide greater co-funding support

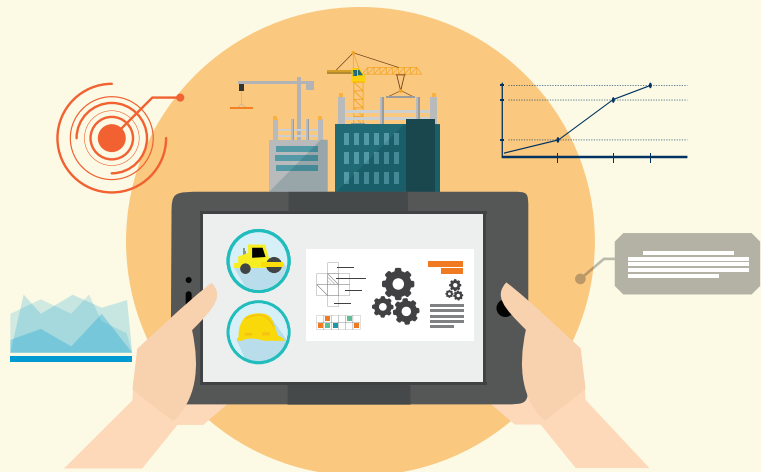
for the adoption of productive technologies under the CCPF.

- Nurture innovation within the industry through the Building Innovation Panel (BIP), a high-level inter-agency group co-chaired by MND and BCA.
- Identify 35 key technologies under seven R&D clusters through the MND/BCA R&D roadmap to change the way we build.
- Provide incentives for local DfMA facilities. We have set aside land for the development of Integrated Construction and Prefabrication Hubs (ICPHs) to support local DfMA production. We will also be extending the Land Intensification Allowance (LIA) scheme to provide tax relief on capital expenditure incurred in the construction of ICPHs.

### 3 BETTER-INTEGRATED CONSTRUCTION VALUE CHAIN

Collaboration among the various stakeholders needs to be enhanced through Virtual Design and Construction (VDC). VDC integrates design, prefabrication and construction. It can identify upstream design clashes and simulate downstream construction workflow — like a full-dress rehearsal in the virtual environment — thanks to the use of Building Information Modelling (BIM) technology. BCA is encouraging all stakeholders to adopt BIM by:

- Getting CCPF to fund projects that adopt VDC and BIM collaboration.
- Running training programmes through the BCA Academy for senior and middle management,



and also technicians competent in VDC and BIM.

- Raising awareness of BIM through the Centre for Lean & Virtual Construction (CLVC) at

the BCA Academy, a first-of-its-kind experiential facility for BIM, VDC and lean construction. As of December 2016, about 1,700 visitors have visited CLVC.

# BCA GALLERY REOPENS

*A bigger and better gallery now greets visitors to the BCA Academy, thanks to a year-long revamp in 2016.*

What was formerly a one-storey showcase is now a two-storey experiential journey, featuring multimedia and interactive exhibits. The revamped BCA Gallery, officially opened on 13 April 2017 by Minister for National Development and Second Minister for Finance Mr Lawrence Wong, is divided into six zones, each focusing on a different facet of Singapore's built environment (BE) sector.

"With this revamp incorporating the latest progress and achievements of the BE sector, we hope visitors will have a better knowledge and understanding of Singapore's built environment," said BCA CEO Dr John Keung in his welcome address. "More importantly, we want to pique the interest of the young, who are the future of our industry, by giving them a glimpse of the future trends and opportunities that the sector has to offer."



Left: BCA CEO Dr John Keung delivering his welcome address.

Below: Minister Mr Lawrence Wong visiting the interactive wheelchair exhibit.







Mr Lawrence Wong presenting a token of appreciation to the representatives from the Singapore Association of the Visually Handicapped (SAVH) for providing valuable feedback during the BCA Gallery revamp and Sensory Garden enhancement.

Exhibits that are geared towards the young include an interactive multimedia station that lets them take on the role of Temporary Occupation Permit (TOP) inspectors, and a profiling quiz for them to discover which BE career best suits them.

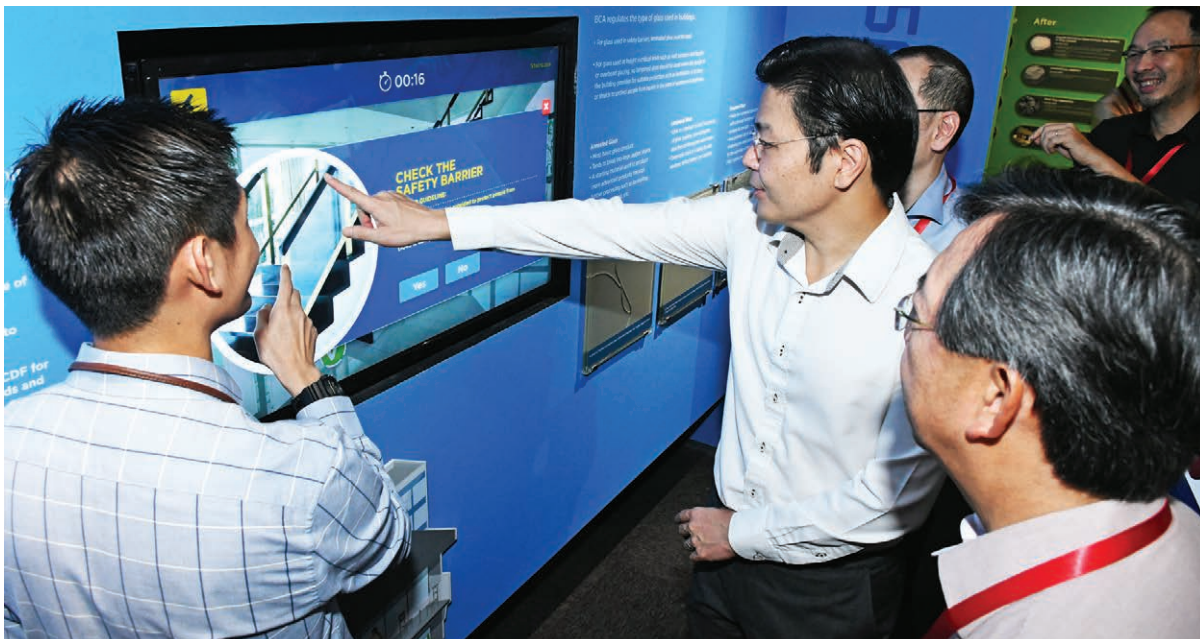
Visitors can learn about the importance of Universal Design (UD) through an interactive wheelchair exhibit, which allows them to experience how UD features assist wheelchair users when they head to the cinema, or to the park for a picnic. The Sensory Garden, an

extension of the gallery, has also been revitalised with the addition of more plant varieties, vibrant colours and interactive elements to engage the five senses. It is also a showcase of UD features such as braille signages, tactile indicators and grab bars.

At the opening ceremony, Mr Wong also presented tokens of appreciation to 27 organisations that contributed to the revamp of the gallery, including seven educational institutions that participated in focus group discussions.



Above: Students from Woodgrove Secondary School sharing information on an interactive multimedia display with Mr Lawrence Wong.



Mr Lawrence Wong trying his hand at role-playing a Temporary Occupation Permit (TOP) inspector.

# ON TO NEW CHALLENGES

*Dr John Keung has led BCA for the past 11 years. Now that he is about to step down as CEO, Pillars asks him about his thoughts on leading the organisation in the past decade.*





**A prominent figure in the built environment sector here in Singapore, Dr John Keung obviously has a passion for infrastructure, building and town planning, an area he studied extensively for (he has a Masters and PhD in Town Planning from the University of Wales).**

Dr Keung assumed leadership as CEO of BCA in June 2006. Prior to that, he worked in the Housing & Development Board (Deputy CEO), Ministry of National Development (Director of Strategic Planning), and Urban Redevelopment Authority (Deputy Chief Planner, Deputy CEO).

After leading BCA for 11 years, Dr Keung is about to move into the next phase of his career as Dean of BCA Academy. But before he takes off his CEO hat for good, *Pillars* sits the man down for a heart-to-heart chat:

**What three words would you use to describe your time as the CEO of BCA?**

“Exhilarating” because there was not a dull moment in the 11 years I was CEO; “assured” because I know that I am not alone but in the company of a great team; and “rewarding” because I played a part in turning dreams into reality.

**What do you hope to achieve in your upcoming new appointment as the Dean of BCA Academy?**

The Academy is already an outstanding institute of higher learning for the built environment sector with a strong brand locally and overseas. I think there are three key areas that we must do more in the next few years:

- It is very important for us to transform the Academy into a knowledge hub for everyone in the built environment sector in the Asia-Pacific region

- We must increase the intake of locals into our diploma and specialist diploma programmes to build a strong local core to anchor the industry
- We need to integrate the R&D work carried out by the two affiliated BCA research institutes (BERII and BETC) into our curriculum to provide the latest cutting-edge content for the benefit of our students and the industry



**We uphold BCA's core values, “We Care, We Dare and We Can”, and work as a team in these exciting times for the industry and BCA.**



**Dr John Keung**  
CEO

Building and Construction Authority

**Please share with us an anecdote or short story that helped to shape your vision as CEO of BCA for the past 11 years.**

I used to share with my colleagues a short story way back in 2006, the year I became CEO of BCA. It is a conversation between Alice and the Cat, two key characters in *Alice's Adventures in Wonderland*, a story written by Lewis Carroll.

“Would you tell me, please, which way I ought to go from

here?” asked Alice. “That depends a good deal on where you want to get to,” said the cat. “I don't much care,” said Alice. “Then it doesn't matter which way you go,” said the cat.

To me, the message is clear and simple: if one does not know where to go, one will never get there. We in BCA know where to go since our vision for our industry and for BCA is crystal-clear, and we have been rolling out key strategies to work towards transforming the built environment sector into one that is future-ready. We uphold BCA's core values, “We Care, We Dare and We Can”, and work as a team in these exciting times for the industry and BCA.

**What is the core function of BCA? Please share one example of how you have rolled out improvements in this area.**

BCA's core function has three key components. We are the building regulator for Singapore. We champion the built environment sector, making sure that it continues to be a key player in nation building. We help build capability for the industry to meet its long- and short-term needs.

Take our building regulator role as an example. Safety is mission-critical for us at BCA. We recently put in place a rigorous regulatory framework for lift and escalator safety after many years of hard work. Although there is still a lot more to be done, we have at least moved ahead to improve public safety in this critical infrastructure, making high-rise and high-density living safe and convenient.

**What strategies implemented during your tenure as CEO did you feel were most impactful?**

Our productivity drive was seen by some as an almost impossible task 10 years ago. However, in a



## FORWARD-LOOKING STRATEGIC THINKER

Dr Keung was awarded the Public Administration Medal (Gold) by the Singapore Government for his contributions to public administration.

He was named one of the Top 25 Newsmakers of the Year 2013 by Engineering News-Record, a US-based engineering magazine published by McGraw Hill, for his work guiding Singapore as leader in sustainable design and construction.

In 2015, he was the first recipient from Southeast Asia to receive the prestigious Chairman's Award by the World Green Building Council (WorldGBC).

short span of six years since 2010, we moved the needle to get our industry to achieve a cumulative 10% site productivity improvement and, as a result, cut the need to import another 27,000 foreign construction workers.

In the last three years up to 2016, we achieved a 2% improvement in site productivity every year. To put this in context, we have never achieved 2% per year improvement ever since we started collecting data on site productivity 12 years ago. Indeed, what is even more significant is that we in BCA have almost single-handedly infused digital engineering and game-changing technologies such as BIM and PPVC into our sector, which historically

was not known to be receptive to change.

Of course, we are not going to stop here. Last year, we made the first move to prepare our sector for the next big jump through the launch of the Construction Productivity R&D Roadmap. Our BCA Built Environment Research and Innovation Institute (BERII) has also worked with hundreds of experts in the industry and identified 35 key technologies under seven R&D clusters to change the way we build and sustain productivity improvements in the long term. These areas include Design for Manufacturing and Assembly (DfMA), Building Information Modelling (BIM) and Virtual Design and Construction (VDC).



**We have also brought the BCA Green Mark to 14 countries and about 80 cities in the region through more than 300 Green Mark projects outside Singapore.**



**Dr John Keung**  
CEO

Building and Construction Authority

**What were the most memorable milestones that BCA achieved during your watch as CEO?**

BCA stands for a safe, high-quality, sustainable and friendly built environment. There are many milestones that BCA has achieved over the past 11 years that I am very proud of. Let me highlight a few that come to mind.

On the quality front, we have finally cemented productivity in our quality framework with the launch of the CONQUAS 9th edition late last year, encouraging the adoption of Design for Manufacturing and Assembly (DfMA) in our quality assessment framework.

I am also proud of BCA's report card in the green building movement locally and in the region. In a short span of slightly more than 10 years, from an almost zero base, we 'Green-marked' one-third of our entire building stock, or more than 3,000 building projects with a gross floor area (GFA) close to 90 million m<sup>2</sup>.

In terms of potential energy saved, it is a whopping 2,500 Gigawatt-hours every year. This is an achievement very few cities can dream to have. We have also brought the BCA Green Mark to 14 countries and about 80 cities in the region through more than 300 Green Mark projects outside Singapore.



Left: Dr Keung (in green tie) with Ms Denise Phua, Mayor of Central Singapore CDC, at BCA's green building exhibition 2014



Top circle: More than 50 students participated in the inaugural Building Information Modelling Shoot-out competition during the Singapore Construction Productivity Week 2014

Right: BCA organised A Walk in the Park at Gardens by the Bay as part of the inaugural Singapore Universal Design Week 2014

And, of course, to take care of our ageing society, BCA is continuously championing a user-friendly and inclusive built environment. Today, about 60% of our commercial and institutional buildings are equipped with basic barrier-free accessibility features. Our efforts in Universal Design have gone beyond buildings to public spaces, with the launch of the new Universal Design Guide for Public Places 2016 by Minister Lawrence Wong last year.



**INITIATIVES IMPLEMENTED**

Here's an overview of the key policy changes and initiatives that took place under Dr Keung's watch as CEO of BCA since 2006.

**Safety Wave**

- 2008: 1st from Southeast Asia in the Inter-Jurisdictional Regulatory Collaboration Committee (IRCC)
- 2011: 1st in the world to develop CORENET 3D BIM e-Submission (for regulatory approval)
- 2016: Fastest in the world to issue Construction Permit (since 2010)

**Quality Wave**

- 2007: 1st Quality Masterplan
- 2015: 1st Partner with SPRING Singapore for Integrated Business Excellence assessment and ISO 9001 audits for the built environment sector

**Universal Design Wave**

- 2006: 1st Barrier-Free Accessibility Masterplan
- 2008: 1st in Southeast Asia – Accessibility Rating System
- 2014: BCA Universal Design Mark recognised as 'Innovative Practice' at Zero Project Conference in Vienna
- 2015: Singapore ranked one of the Most Accessible Travel Destinations by Lonely Planet

**Sustainability Wave**

- 2006: 1st Green Building Masterplan
- 2009: 1st in Southeast Asia to develop the Zero Energy Building located at BCA Academy
- 2011: 1st in Asia to set up a United Nations Environment Programme (UNEP) Collaborative Centre, the BCA Centre for Sustainable Buildings
- 2016: 1st in the world to develop BCA SkyLab, a high-rise rotatable laboratory for the tropics

**Advanced & Productive Wave**

- 2010: 1st Construction Productivity Roadmap
- 2014: 1st PPVC project began construction in Nanyang Technological University (NTU)
- 2015: 1st in Southeast Asia to develop the Centre for Lean and Virtual Construction
- 2015: 1st large scale Mass Engineered Timber (MET) project, the Wave, a sports hall, began construction in NTU

# NTU, A LIVING LAB FOR SUSTAINABILITY, GETS GREENER

*Sustainability, eco-friendly features and innovative building technologies — these are buzzwords that drove the design and construction of two recent projects at Nanyang Technological University, Singapore (NTU Singapore).*

**NTU Singapore is no stranger to making its mark on the architectural landscape of this island. After all, it is home to international icons such as The Hive and the School of Art, Design and Media.**

But behind their unique designs, many of the buildings on the university's lush 200-hectare campus are also high-performance green buildings — to date, 53 buildings have received BCA's Green Mark Platinum award. In 2016, NTU also earned the prestige of being the first BCA Green Mark Platinum<sup>STAR</sup> Champion.

Under its EcoCampus initiative, NTU aims to become the greenest campus in the world, while reducing energy and water usage by 35% by 2020. How does it plan to achieve those goals? Part of the answer lies in how the structures are designed, constructed and maintained. The university is also a pioneer in embracing green technologies and innovative construction methods for its buildings.

*Pillars* highlights the innovative features in its latest architectural icon — The Wave — and speaks to two building professionals about the technologies employed in the new student residences at Nanyang Crescent.

## THE WAVE

NTU's mega sports hall is the first large-scale building in Southeast Asia constructed mostly with Mass Engineered Timber (MET). It is also a showpiece of innovative technologies:

### Wave-like timber roof that spans 72m

- Constructed using MET, which is engineered using wood from

sustainable forests; MET provides five times better heat insulation than concrete

- MET helps to reduce dust, noise, and manpower on-site as MET components are prefabricated off-site before being brought to the site for assembly

### Cavernous three-storey space

- Able to house three basketball courts or 13 badminton courts
- No internal pillars necessary to support the roof because MET is stronger than steel or concrete

### Eco-friendly features

- Double-skin external walls with air pockets that insulate against the heat
- No conventional air-conditioning system needed; walls have special metal coils to cool the air as it enters the hall
- Energy-saving LED lighting and solar-powered systems
- Designed to take advantage of its natural surroundings



## TRANSFORMING THE WAY WE BUILD

Each unit in the new student residences at Nanyang Crescent was built somewhere else, complete with internal fixtures such as windows and lighting, then assembled on-site Lego-style. This project at NTU is among the first public high-rise buildings constructed using Prefabricated Pre-finished Volumetric Construction (PPVC), a ground-breaking technology in the built environment sector.

The benefits of this innovative method of construction are numerous — as some of the components are built off-site, construction time and manpower requirements can be reduced by 15–20% and 25–40% respectively. There is also less noise and dust pollution at the building site.

However, as with any new technology, part of the learning curve is in overcoming teething challenges. “At the time of design, there was no precedent of such height and scale of PPVC construction in Singapore,” notes Aaron Foong, Director at KTP Consultants, the firm that handled the civil and structural engineering aspects of the project.

As a result, Foong’s team at KTP had to do “substantial literature review of overseas projects and work very closely with the specialist PPVC manufacturer and builder to obtain construction feedback”. They also carried out sophisticated engineering analysis to ensure that adequate robustness is imbued in the PPVC structures.



The use of PPVC technology for the new student residences at Nanyang Crescent reduced the construction time and manpower requirements on-site.

### Design considerations

To deal with the uncertainty in designing for PPVC, the project team at SAA Architects Singapore used Building Information Modelling (BIM) to manage the process. Clement Koh, Senior Architect at the firm, says, “This allowed us to consider the design holistically and identify potential pitfalls before construction.”

While there are constraints in designing a structure with preset modules, Koh shares that “the key is finding the right balance between aesthetics, buildability and cost-effectiveness”.

“As the building is largely composed of building components constructed off-site, designing for ease of fabrication and assembly is critical. We studied and generated a few variants of these module types as building blocks for an overall interesting hostel design suited for their purpose,” Koh explains.

He adds that it is especially important to obtain early confirmation of the design, even for finishes and

fittings, so that there is lead time for procurement and fabrication.

### Not just stacking Lego

Although the PPVC method reduces the time needed to erect a building, “the quality control of the fabrication tolerances in the factory and logistics management in the assembly of the modules are critical in the PPVC installation cycle,” Foong reveals.

After the individual units are completed, they need to be stored somewhere before assembly. This requires efficient logistics planning and additional land for storage. Foong suggests that, on top of efforts by inter-government agencies to allocate land, the stakeholders involved could also look into Just-in-Time delivery of PPVC modules to optimise storage space.

### Looking ahead

While design and construction firms increasingly adopt these new technologies, key to a project’s success lies in the depth of collaboration among stakeholders.



Bird’s eye view of The Wave and its cavernous interiors.

# MORE THAN 1,600 ATTEND CAREER FAIR

*The six-day event received strong support from industry firms, institutes of higher learning, jobseekers and students.*

**This year's Built Environment Career and Education Fair comprised two components: a virtual fair from 20–24 March and a physical event on 25 March.**

Organised by BCA, the virtual

fair offered a platform for job seekers to connect with industry firms through 'live' video or text chats. Over five days, the website attracted 550 visitors.

The physical event on the last day of the fair recorded an even stronger response. More than 1,100 jobseekers and students made their way to the atrium of JEM, with some applying on the spot for the 350 job openings offered.



Top: Many took the opportunity to meet and network with professionals from government agencies and participating firms.



Left: The one-day physical event was all abuzz with people seeking careers and training opportunities in the built environment (BE) sector.





Left: Woh Hup was among the 33 industry firms that had a booth at the physical event. Other participating companies included the Keppel Group, Tiong Seng, Sembcorp Design and Construction, EM Services, DLE M&E and Schindler Lifts (Singapore).



The organising team from BCA huddled for a group shot after a job well done.



Government agencies such as BCA, LTA and URA also reached out to jobseekers and students.

Left: Complementing the career fair was a series of talks on educational pathways towards BE careers, industry outlook and professional development.

# NURTURING GREEN ADVOCATES

*BCA's Back to School internship programme aims to engage young people and entice them to become ambassadors of sustainability issues.*

To help inject new blood into the green collar workforce for the built environment industry, BCA is reaching out and engaging youths to inculcate a passion and natural curiosity in greening our built environment. The idea

was to turn tertiary students into advocates of environmental sustainability and, hopefully, into the next generation of green-conscious workers.

Through the Back to School internship programme, BCA would

guide students to be Green Mark consultants so that they can help their alma maters attain BCA Green Mark certification, and strengthen any environmental lessons and related programmes these primary and secondary schools may have.



BCA received a Gold ranking for the Back to School Programme at the 2017 Best Practices Awards organised by APEC Energy Smart Communities Initiative (ESCI).

## GREEN MARK RATING

Admiralty Secondary School

Pei Cai Secondary School

Ang Mo Kio Secondary School

Chung Cheng High School (Main)

Serangoon Garden Secondary School

Serangoon Secondary School

Xinghua Primary School

Gold

### Programme objectives

The internship programme has three objectives:

- To expose students to sustainability and green building careers
- To provide a platform for students to employ their technical and management skills that they acquired in school and at BCA
- To get students to be envoys of the sustainability message

The pilot for the programme started in 2015 with a group of 12 students from Temasek Polytechnic. Due to encouraging take-up rate, the programme has since been extended to other polytechnics.

Beatty Secondary School

Da Qiao Primary School

Hong Wen School

Gold<sup>PLUS</sup>

### Meeting the mark

Seven schools have been awarded a 'Gold' Green Mark Rating and three achieved 'Gold<sup>PLUS</sup>'.

Even though the Back to School programme was only launched recently, it has garnered much traction and support from the schools and students. Of the first batch of students who completed their internship in 2015, all of them graduated from the polytechnic and went on to pursue environment-related courses at the National University of Singapore.

Most notably, the programme was recognised by the Energy Smart Communities Initiative (ESCI), a branch of the Asia-Pacific Economic Cooperation (APEC) that looks into the growth of the green movement, sustainability issues, long-term job creation, and reduction of energy intensity. At its 2017 Best Practices Awards, BCA was awarded a 'Gold' ranking under the Smart Jobs and Consumers category.

Students Divyesh Karnavat (far left) and Siow Chin Yee (third from left) in a discussion with their mentors from the Back to School programme.



## Meeting the interns

*Pillars* chats with two students who are still undergoing the internship programme. Divyesh Karnavat recently graduated with a Diploma in Integrated Facility Management from Temasek Polytechnic, while Siow Chin Yee is pursuing a Diploma in Hotel and Leisure Facilities Management at Singapore Polytechnic and interning at BCA.

of sustainability and underwent an exercise to reflect on what sustainability meant to us. We were introduced to BCA's policies and initiatives under the Green Building Masterplan, which allowed us to understand the context of our work as Green Mark consultants for schools.

BCA's Back to School Companion, a handbook filled with technical information, helps us understand how to green schools. It details the different stages of my internship and the criteria BCA uses to evaluate Green Mark for existing schools on which to base my calculations.

## Are the BCA lessons applicable across the board, or would you have to customise them?

Most of the lessons are applicable across the board; we can find similarities among the schools we visited.

For example, how to calculate the energy efficiencies of air conditioning and lighting systems or how to conduct a health check on the school.

Nonetheless, every school would have its own set of constraints, both in its infrastructure and programmes. Under the guidance of my BCA mentors, we worked to develop programmes and provide recommendations according to the schools' needs.

## So have you gone back to visit your alma maters?

Yes, I have! I am currently assisting Marsiling Primary School and Chung Cheng High School (Yishun) with their Green Mark certification, and it was enjoyable to be back there. My principals and teachers were very welcoming, and glad to see their alumna returning to contribute towards the sustainability agenda.



## SIOW CHIN YEE

PURSUING A DIPLOMA IN HOTEL AND LEISURE FACILITIES MANAGEMENT

### How did you learn of the Back to School internship programme?

I heard about the programme through my lecturer. I had taken a module, Environmental Management and Sustainability (EMS), which exposed me to the BCA Green Mark certification and piqued my interest in sustainability in the Built Environment sector. I was keen to take part in the internship when I learnt that I could go back to 'green' my old school.

### What training did you receive before becoming a Green Mark ambassador?

The first week involved orientation. We were introduced to the topic



Evaluating the energy efficiency of the lighting system.



**DIVYESH KARNAVAT**  
**DIPLOMA IN INTEGRATED FACILITY**  
**MANAGEMENT**

**You grew up in Dubai, which has a booming construction industry. Is that why you took up a course related to the built environment?**

As a kid, I often looked at big construction projects that were going on around our apartment and wondered, "How can this building remain stable?" or "Who is in charge of building such tall buildings?" These questions

really got me interested in the built environment and drew me to the idea of becoming a facility manager.

**What was it about the Back to School internship that made you want to join?**

I picked BCA because I was drawn to the freedom interns were given to innovate and apply what we have learnt at BCA.

Another major contributing factor was that we would be given an actual project to work on rather than mundane administrative tasks. I found it challenging and meaningful to be able to provide valuable advice for my alma mater to achieve the Green Mark award.

My supervisors seemed really supportive during the interview, which helped me make my decision.

**So what projects did you initiate at your alma mater?**

For Serangoon Secondary School, my team and I started by introducing what Green Mark is to the school leaders. It was a major decision for them, as they would have to devote time and resources to the project.

Next, we proceeded with checking the energy performance and health status of the school. We were faced with various challenges during these checks and had to devote more time and adapt to situations with the help of our mentors.

Apart from the hardware, we wanted to share what we have learnt at BCA and in school with our juniors. We brainstormed to prepare materials that could be used to disseminate information on sustainability to our juniors. We hope that these materials will inspire them to practise green habits.

**Would you encourage students to take up this internship?**

Definitely. It really tests your knowledge, helps you excel as a student, and motivates you to learn more. At the same time, you will have the chance to experience the real working world.

What makes BCA stand out is the safe learning environment they give interns to make mistakes and learn from them. At the same time, the guidance and support from the supervisors really keep us going.



Checking the energy performance of air conditioner units.

# HUNGRY TO VOLUNTEER

BCA gives back through Food from the Heart charity.



The group of BCA volunteers at the FFTH warehouse, raring to start a day of sorting and packing.



Unloading the food items from baskets for sorting.



Checking the expiry date of a bottle of cooking oil.



The volunteers beaming with the fruits of their labour — 542kg of goodie bags!

In affluent Singapore, there are pockets of needy families and children who go hungry every day, and thus do not receive adequate nutrition. To help alleviate this situation, 25 volunteers from BCA's Special Functions Group, led by Group Director Kaliannan Thanabal, participated in the Food Goodie Bag programme by non-profit charity Food from the Heart (FFTH).

On 20 March 2017, these volunteers headed to FFTH warehouse to sort and pack non-perishable food donated by members of the public. Working in two teams, they checked the expiry dates of staples such as rice, canned food and beverages, then packed them into goodie bags for distribution.

# FUN DAY OUT

*BCA staff arranged for clients of Bishan Home for the Intellectually Disabled to visit a dairy farm.*



Above: A client from the Bishan Home (in orange T-shirt) being guided during the feeding session.

Left: All smiles for a group shot outside Hay Dairies.

**In March this year, 23 clients of Bishan Home for the Intellectually Disabled and some of their family members had a fun-filled day out at Hay Dairies Goat Farm, thanks to one of BCA's Corporate Social Responsibility efforts.**

Together with a team of five from Bishan Home, 18 volunteer staff members from BCA paired up with clients from the Home's Day Activity Centre for the excursion. After an orientation briefing at the farm, the participants delighted in seeing the goats up-close and feeding them by hand.



BCA volunteers getting to know the clients they were paired with.



# BCA'S PRO-ENTERPRISE INITIATIVES

*BCA is working with other government agencies to improve the ease of doing business.*

In the previous issues, we covered the role of the Inter-Agency Coordinating Committee (IACC), a multi-agency working group led by BCA that looks into conflicting regulatory requirements encountered in projects.

To streamline processes and update obsolete requirements, IACC got its member agencies to review the applications they'd received for waivers of building regulations. As a result of the review completed in 2016, certain building regulations were amended. This means developers and contractors no longer need to apply for some common waivers.

Here is an overview of some of the changes.



## BUILDING AND CONSTRUCTION AUTHORITY (BCA)

### Daylight reflectance

The control of daylight reflectance has been changed from prescriptive to performance-based requirements. In addition, materials other than glass can now be used for building works on an angle of less than 20 degrees, as long as its specular reflectance does not exceed 10%.

### Size of opening in safety barriers

The size of any opening in safety barriers installed in plant or equipment rooms and maintenance areas can now be up to 500mm in size.

## SINGAPORE CIVIL DEFENCE FORCE (SCDF)

### Fire code

The following applications are now permitted:

- Fire-rated shutters to be used as compartmentation walls
- Fire escape staircases that discharge into open-sided corridors
- Open-space exit staircases on mezzanine floors of industrial buildings

## NATIONAL ENVIRONMENT AGENCY (NEA)

### Noise impact assessment

NEA requires project teams to complete the Noise Impact Assessment, and submit proposed mitigating measures — if any — at the planning stage of the project.

### Roof gutters and rainwater downpipes

In view of concerns over mosquito breeding, NEA has prohibited roof gutters and downpipes in new developments. However, downpipes at accessible maintenance areas, such as balconies and roof terraces, may be allowed.

## NATIONAL PARKS BOARD (NPARKS)

To meet NPark's green buffer and peripheral verge requirements, projects can incorporate alternative solutions such as vertical greenery, green roofs and green link-ways.

## PUBLIC UTILITIES BOARD (PUB)

### Flood prevention measures

Under the current Code of Practice on Surface Water Drainage, project teams can propose alternative flood protection measures instead of building higher platform levels.

## URBAN REDEVELOPMENT AUTHORITY (URA)

### Flexible design guidelines

Homeowners and developers now have more flexibility in designing a landed house, thanks to the new Envelope Control Guidelines. They can deviate from existing planning guidelines, and configure the internal layout of landed homes to include features such as natural lighting in basements and non-sloping roofs.

## LAND TRANSPORT AUTHORITY (LTA)

### Parking spaces

Most of the waiver requests LTA receives are related to the provision of parking spaces. LTA would usually consider such requests favourably if project teams address safety-related requirements. For example, if there are fewer parking aisle due to site constraints, the project can provide wider parking spaces.









IACC has lined up a series of outreach sessions to engage industry associations this year.

### UPCOMING INITIATIVES

To further enhance productivity in the construction industry, IACC has lined up a series of new initiatives.

There is an ongoing project to harmonise regulatory requirements across its member agencies. The committee will proactively review requirements set by the various agencies in order to reduce ambiguity and achieve consistency. IACC members are also consulted

before regulatory amendments to identify conflicts before implementation.

In addition, to enhance the feedback-gathering process and identify regulatory pain points, the committee is currently holding focus group discussions with industry associations.

The committee is also planning an IACC seminar, which aims to allow agencies to make use of this platform to update the

industry on changes, and for the representatives from firms to seek clarifications.

To raise the visibility of the committee, IACC will also be participating in the Singapore Construction Productivity Week organised by BCA in October this year to interact with the industry and gather suggestions on areas for review. For more information on the IACC, please contact:

**BCA\_IACC\_secretariat@bca.gov.sg**



Panel of directors and department representatives for an industry sharing session.

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## JUNE 2017

**1–2 Jun 2017**

Sustainable Facility Management Solutions (15th Run)

**6–7 Jun 2017**

Designing and Constructing CLT & Glulam Structures (3rd run)

**6 Jun 2017**

Good Industry Practices (Waterproofing for External Wall) (Re-run)

**7 Jun 2017**

CONQUAS Training for Builders (Mandarin)

**8 Jun–end Dec 2017**

Certification Course for Green Mark Facilities Professional 2017 (Batch 4)

**8–9 Jun 2017**

Energy Efficiency for Electrical Systems (4th Run)

**12 (am)–13 Jun 2017**

Understanding Building Control Regulations — Non-Structural Buildings Works (4th Run)

**13 Jun 2017**

Good Industry Practices (Timber Doors, Wardrobe & Kitchen Cabinet) (13th Run)

**15 Jun 2017**

CP88 on Temporary Electrical Installations (4th Run)

**19–20 Jun 2017**

Design of Steel-Concrete Composite Structures using Eurocode 4 (7th Run)

**20 Jun 2017**

Good Industry Practices (Painting)

**20, 22, 27, 29 Jun & 4 Jul 2017, evenings**

Geotechnical Design using Eurocode 7 (16th Run)

**21 Jun 2017**

Design of Bolted and Welded Joints in Steel Structures using Eurocode 3 (9th Run)

**27–28 Jun 2017**

BIM for Structural Design and Detailing **NEW**

**28–30 Jun 2017, day**

Internal Audit (QEHS) Course based on Quality ISO 9001, Environmental 14001 and Health & Safety OHSAS 18001 (28th run)

**28–29 Jun, 4 & 6 Jul 2017, evenings**

Supervision of Piling Works (27th Run)

**29 Jun–14 Jul 2017 (5 days)**

Lift and Escalator Course for Engineers (5th Run)

## JULY 2017

**3–4 Jul 2017**

Advanced Concrete Design using Eurocode 2

**3, 5, 7, 10, 12, 14, 17 & 19 Jul 2017, evenings**

Supervision of Deep Underground Construction Works (4th Run)

**7 Jul 2017**

Requirements for Environmental Sustainability in Buildings and The Green Mark Scheme (39th Run)

**10–11 Jul 2017**

Design of Steel Structures using Eurocode 3 (9th Run)

**11–12 Jul 2017**

Computational Design for Architecture **NEW**

**13 Jul 2017**

BCA-SPM Joint Seminar 2017  
Maximising Productivity through Project Collaboration

**13, 14 & 17 Jul 2017**

Solar Modelling (22nd Run)

**17–18 Jul 2017**

Construction Contract Procurement & Negotiations **NEW**

**27 Jul 2017**

Preparing and Defending Loss and Expense Claims (26th Run)

**Starting on 10 Jul 2017**

Specialist Diploma in Virtual Design & Construction (2nd Intake)

**Starting on 24 Jul 2017**

Specialist Diploma in Lean Construction (3rd Intake)

**Starting on 24 Jul 2017**

Specialist Diploma in Design for Manufacturing & Assembly (3rd Intake)

## AUGUST 2017

**Starting on 7 Aug 2017**

Specialist Diploma in Interior and Landscape Design (28th Intake)

**Starting on 15 Aug 2017**

Specialist Diploma in Architectural Technology (7th Intake)

## Contact

**BCA Academy**

**Marketing & Business Development**

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Email: [bca\\_academy@bca.gov.sg](mailto:bca_academy@bca.gov.sg)

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**Starting in May 2017 (Full-time)**

Application closing date: 15 May 2017  
Bachelor of Engineering (Honours) (Civil) (1st Intake), awarded by The University of Newcastle, Australia

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**Starting in Jul 2017 (Part-time)**

Application closing date: 30 Jun 2017  
Bachelor of Construction Management (Building) (Honours) (4th Intake), awarded by The University of Newcastle, Australia

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**Starting in Oct 2017 (Full-time)**

Application closing date: 8 Sep 2017  
Bachelor of Construction Management (Building) (Honours) (10th Intake), awarded by The University of Newcastle, Australia

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