EVENT FACTSHEET

The third Singapore Construction Productivity Week 2013 is the hallmark event to celebrate the construction industry's productivity journey. The event presents a great platform for suppliers, developers, architects, consultants and builders to come together and exchange ideas in transforming the construction industry towards higher productivity level.

The Week features several key events, including:

1. **BIM Mobile App Challenge 2013 (Prize-Giving Ceremony – 31 July)**
   - The BIM Mobile App Challenge is a new competition meant to cater for the increasingly popular usage of tablets in the industry.
   - The BIM Mobile App Challenge 2013 aimed to gather innovative ideas on mobile applications that can help architects, engineers, contractors, quantity surveyors and building owners to collaborate better using BIM from the design to construction stage.
   - The competition commenced on 6 May 2013, 9 a.m. and ended on 28 June 2013, 9 a.m.
   - A total of 8 teams submitted written proposals, and 6 teams went on to develop their ideas into prototypes.

2. **BIM Competition 2013 (Prize-Giving Ceremony – 31 July)**
   - For the third consecutive year, BCA has organised the online Building Information Modelling (BIM) Competition in conjunction with the Singapore Construction Productivity Week 2013.
   - The 48-hour BIM Competition 2013 commenced on 1 July 2013, 9 a.m. and ended on 3 July 2013, 9 a.m. in Singapore.
   - Within the 48-hours competition, teams are required to provide the detailed BIM model and documentation as much as possible. These included architectural and structural designs, building services designs and calculations, sun and wind analysis,

energy analysis and consumption data, constructability analysis, model checking, among others.

- For the first time, the multi-disciplinary collaboration subcategories under 'Industry' and 'Education' will be open for international participation.
- Since the introduction of the BIM competition in 2011, it has received much attention and support from the built environment industry. This year, a total of 37 teams signed up, out of which 8 were from overseas, such as Korea and the United Kingdom.

3. <u>Skilled Builders Competition (31 July)</u>

- The Skilled Builder Competition is jointly organised by BCA, the Singapore Contractors Association Limited (SCAL) and the Specialist Trade Association of Singapore (STAS).
- It aims to foster better productivity through technology adoption and promote proper work procedures and highlights the importance of using the right skills to achieve productivity improvements.
- The challenge is to produce accurate and high quality work within a designated timeframe – essential requirements for today's fast-paced construction industry. Participants will be awarded a certificate of participation and prizes will be given out to the winners of each category.
- There are four categories for skilled tradesmen to pit their skills against each other. The overall champion in these 4 categories can then be crowned the "Champion Skilled Builder":
    - Scissors Lift and Boom Lift Competition,
    - Drywall Competition,
    - Plumbing Competition and
    - Timber Floor Competition

4. <u>Build Smart Conference (31 July – 1 August)</u>

- The Build Smart Conference is a 2 day conference that focuses on Construction Technology and Building information Modeling (BIM).
- The aim of the conference is to keep the industry updated on innovative construction technologies, raise industry awareness on productivity and showcase projects that have successfully adopted productive methods of construction.

5. <u>BuildTechAsia (31 July – 2 August)</u>

- BuildTechAsia2013 is the region's leading tradeshow for the building and construction industry. Organised by Sphere Exhibits and hosted by the Building and

Construction Authority of Singapore, the three-day trade show is a key event of the Singapore Construction Productivity Week.

- This year's exhibition focuses on Construction IT and key productive technologies that can help companies to grow and cope with the demands of an evolving industry facing a tightening of foreign workers supply and a constant elevation of what is considered acceptable standards.
- The exhibition is spread over 10,000 square metres of space at the Singapore Expo and aims to attract 4,000 to 6,000 visitors.

6. <u>International Panel of Experts (IPE) on Building Information Modelling (1 August)</u>

- Building Information Modelling (BIM) has been identified as one of the game changing technologies to improve productivity in Singapore. To promote the wider adoption of BIM in the industry, BCA launched a BIM Roadmap in 2010 to champion this.
- An International Panel of Experts (IPE) was also formed to review the policies and initiatives under the BIM Roadmap.
- The first IPE meeting was held in November 2011.
- This year's panel includes experts from Australia, Germany, Norway, South Korea, the United Kingdom and the United States.
- At the BIM IPE meeting this year, BCA will seek the advice from both international and local experts to discuss direction of BIM in Singapore moving forward.

7. <u>Productivity Race (2 August)</u>

- The inaugural Productivity Race is a student race that aims to introduce the concept of productivity to the students of construction related courses in Universities and Polytechnics in Singapore.

- During the Race, student participants are required to visit participating suppliers as well as visit construction sites to identify the equipment used to reduce manpower needed.
- Based on clues provided throughout the Singapore Construction Productivity Week, each team of 5 students will travel to the designated locations around Singapore on 2 August 2013. The teams who successfully identify all the locations and complete the activities will win attractive cash prizes.
- 100 students in 20 teams from the National University of Singapore and Singapore Polytechnic have signed up to participate.

BIM FACTSHEET

Internationally, Building Information Modelling (BIM) has been identified as one of the key technologies that will transform the construction industry. In Singapore, the Construction Productivity Roadmap has also identified BIM as a key technology to improve the construction productivity as well as the level of integration and collaboration across the various disciplines in the construction value chain.

About BIM

Building Information Modelling (BIM) is a three-dimensional (3-D) modelling technology that allows the building professionals of various disciplines (architects, structural engineers, structural professionals, M&E engineers and contractors) to explore the building project digitally through an integrated process, before it is even built.

- BIM models and manages not just graphics, but also information – drawings and reports, design analysis, schedules and facilities management – which allows the building team to make better-informed decisions.
- It allows architects, engineers and contractors to share information throughout the project lifecycle to analyse and resolve potential design clashes before construction begin.
- BIM will facilitate better teamwork among the professionals, helping to reduce unnecessary reworks when the project is being constructed.

BCA's BIM Roadmap

BCA has set up the Centre for Construction IT (CCIT) in 2010 to help the construction industry embrace BIM to enhance its productivity and level of integration. A BIM Roadmap was formulated in 2010 to have 80% of the construction industry use BIM by 2015.

In 2011, an industry-led BIM Steering Committee was set up to guide the implementation of the BIM Roadmap. The progress of the Roadmap is also being reviewed by the BIM International Panel of Experts once every two years. BIM Manager Forums were also being set up to solicit and advice on implementation issues.

In the BIM Roadmap, the various key thrusts below were identified to address the challenges faced by the industry when migrating from 2-D CAD to a 3-D BIM platform.

BCA Measures to Facilitate the Adoption of BIM Across the Industry:

A. PUBLIC SECTOR TAKING THE LEAD

- Collaborate with government procurement entities (GPEs) to request the use of BIM for their projects starting from July 2012;
  - Housing Development Board, Land Transport Authority, Ministry of Education, Peoples' Association, Ministry of Health Holdings, Defence Science & Technology Agency, National Environment Agency, Building and Construction Authority, National University of Singapore, Nanyang Technological University, Singapore Sports Council, Changi Airport Group etc. are using BIM for their projects.

B. REGULATORY APPROVAL

- Work with government regulatory agencies to accept BIM e-Submissions for regulatory approvals in phases, starting from July 2013.
  - Architectural BIM e-submission for GFA > 20000 square metres from July 2013
  - Engineering BIM e-submission for GFA > 20000 square metres from July 2014
  - All BIM e-submission for GFA > 5000 square metres from July 2015

C. BUILDING CAPABILITY & CAPACITY

C1. RAISING INDUSTRY AWARENESS

- To increase BIM awareness, various seminars, workshops and conferences on the use of BIM had been organised for the industry to understand the benefits of the technology;

- BCA also encourages the formation of user self-help groups to share their BIM experience and create a bigger voice when dealing with the BIM vendor.

- BCA also organises events such as the BIM Competition and BIM Mobile Apps Challenge as part of the Singapore Construction Productivity week to showcase and demonstrate the value of BIM. These competitions have attracted strong participation from local and international firms as well as Institutes of Higher Learning (IHLs).

C2. EQUIPPING THE EXISTING INDUSTRY PROFESSIONALS AND YOUNG GENERATIONS WITH BIM SKILLS

- Since 2011, the BCA Academy has been offering various BIM courses to equip industry professionals with the necessary know-how in BIM. Courses include:

- BIM Planning for Client and Facility Managers
- BIM Management
- BIM Modelling (covering Architectural, M&E and C&S disciplines)
- Specialist Diploma in BIM (a five month in-depth course to train BIM managers and coordinators)

More than 1000 industry professionals have attended the above courses.

- Collaborate with the various IHLs to include BIM training in their curricula so as to equip the new entrants to the industry with the necessary BIM skills;
  - Almost all building related courses from various IHL (BCA Academy, ITE, Singapore Polytechnic, Temasek Polytechnic, Ngee Ann Polytechnic, National University of Singapore, Nanyang Technological University, UniSIM, and Singapore University of Technology and Design) have included certain components of BIM training.
  - Today BIM is taught at ITE, Diploma, Bachelor and Master degree levels.
  - Approximately more than 2000 students are trained in BIM each year.
  - Final year students from BCAA are also involved in modelling work of actual projects to sharpen their BIM skills. Some of the participating firms have offered jobs to the students after the projects.

- BIM vendors also play important roles in providing BIM training. Besides conducting training courses, they are also providing consultancy clinic and in-depth workshops. Today more than 3400 industry professionals have been trained by them.

- CCIT provides training & chaperon services to:
  - the officers of various Regulatory Agencies and Government Procurement Entities to equipment them with the necessary BIM know-how to process the BIM submitted to them.
  - companies embarking on their first BIM project or regulatory submission.
  - share BIM good practices and experiences with local practitioners via the BIM@SG website

D. INCENTIVISING BIM ADOPTERS

- BCA has also made available part of the S$250 million Construction Productivity and Capability Fund (CPCF) to help firms defray the costs for BIM adoption (in terms of training, consultancy services and costs of hardware and BIM software).

- Firms are given up to six times to apply for the BIM fund so as to give them ample opportunities to develop their BIM skill set by involving in actual BIM projects.

- Firms can either apply for the firm specific scheme or project collaboration scheme. The latter allows them learn how to operate in a multi-party environment.

Moving Forward – Researching future BIM applications

CENTRES OF EXCELLENCE (COE) FOR BIM RESEARCH

- To prepare our BIM adaptors beyond the immediate requirements, BCA will collaborate with the National University of Singapore (NUS) & Nanyang Technological University (NTU) to set up Centres of Excellence (COE) for BIM Research. The COE will focus on applied BIM R&D and advanced training programmes for the industry.

- BCA will work with the COEs to identify potential applied BIM R&D projects that will benefit the industry and address some of the inefficiency in the construction value chain. Subsequently BCA and COE will jointly approach potential sponsors to involve them in the projects.

- **NUS Centre of Excellence in BIM**
  - The NUS BIM Centre of Excellence (COE) will assist the local construction industry to achieve productivity improvement by transforming the way people design, deliver and manage the built environment through BIM innovation and practice, working with local stakeholders as well as international collaborators.
  - The potential research topics identified by NUS are follows:
    - BIM for Safety: sponsored by the Workplace Safety and Health Council
    - BIM for Developer: sponsored CapitaLand, HDB and URA
    - BIM for Process Transformation: Sponsored by BuildingSmart Singapore
    - BIM with GIS: Sponsored by SISV LS Div and SLA

- **NTU Centre of Excellence in BIM**
  - NTU has developed a Framework and Roadmap to enhance the BIM capability of the construction industry in Singapore. As part of this Roadmap, it aims to achieve a 20% minimum in productivity improvement of the construction firms participating in their BIM research projects.
  - The potential research topics identified by NTU are follows:
    - BIM for Precast: sponsored by HDB

- BIM for MEP Sub-contractors: sponsored Samsung CT, Autodesk and STAS
- BIM for Structural Steel: sponsored by Telka

- To date, BCA has worked with NTU to secure the HDB sponsored project “Enhancing the Process of Preparing Precast Shop Drawings through BIM”. BCA is also working with NUS to secure the CapitaLand sponsored project “Development of an Automatic Layout and Feasibility Checking System for Residential Projects”.

OTHER APPLICATIONS

- BCA is also working with vendors to develop BIM add-ons (e.g. Concrete Usage Index and Buildability Score) and mobile applications.

MOU FACTSHEET

MEMORANDUM OF UNDERSTANDINGS

As part of the continuing effort to build new capabilities and foster more partnerships to achieve stronger integration across the entire construction value chain, two Memorandum of Understandings (MOUs) were signed at the official Opening Ceremony of the Singapore Construction Productivity Week 2013:

1. **Memorandum of Understanding (MOU) between the Singapore Institute of Architects (SIA) and the rest of Construction Industry Joint Committee (CIJC)**

   - The Singapore Institute of Architects (SIA) and the rest of Construction Industry Joint Committee (CIJC) associations have agreed to collaborate to adopt an online, cloud-based Building Information Modeling (BIM) design object library (SIA iDOL) developed by SIA.

   - This is in support of Singapore's drive towards adopting BIM technology as an important means to transform the industry work practices for higher productivity.

   - This MOU aims to reduce duplicate effort spent by individual firms in developing similar design objects suitable for BIM software solutions commonly used in the Singapore construction industry. It hopes to standardise the property set and external references for design objects to achieve a truly information-rich model that can support lifecycle usage and to provide the iDOL content free of charge to members of CIJC associations.

   - SIA will be responsible to define, create maintain a suite of generic and manufacturer specific architectural design objects for the industry and to provide, operate and maintain an online platform (known as SIA iDOL) to host and distribute the design objects.

   - The responsibilities of the other CIJC associations are to encourage all their respective members to adopt the use of the iDOL and contribute to the definition.

2. **Memorandum of Understanding between People's Association (PA) and Building and Construction Authority (BCA)**

   - The People's Association (PA) and the Building and Construction Authority (BCA) have signed a Memorandum of Understanding to agree to collaborate on a joint programme where students from the BCA Academy undertake projects to convert paper-based building plans of PA's Community Clubs into digital Building Information Modeling (BIM) format.
   - The purpose is to improve the quality and productivity in the design, construction and lifecycle operation and management of PA's building facilities. At the same time, the partnership will provide internship opportunities to students of BCA Academy.

FACTSHEET ON CONSTRUCTION TECHNOLOGIES

Cross Laminated Timber (CLT)

About Cross Laminated Timber (CLT)

CLT is manufactured from wood harvested from sustainably managed forests and fabricated by binding layers of timber at 90 degrees with structural adhesives to produce a solid timber panel. Unlike sawn timber, CLT can support heavier loads and be applied for structural and non-structural components in buildings. Also, as it is flexible and light (about 500 kg/m3, compared to 2,400 kg/m3 for reinforced concrete), it can be used for the construction of walls and even for floors, beams and columns and lift shafts.

Depending on the dimensions of the structural and non-structural element, the CLT panels can comprise more than three layers of timber and be manufactured in varying sizes, with a maximum length of 18 metres and thickness of 0.5 metres. The CLT panels are also cut in factories for window and door openings before they are assembled on-site.

Benefits of using CLT for construction

- Reduction of waste onsite and positive impact on the surrounding community (via reduced construction noise, truck movements and reduced concrete / general dust emission).
- Faster construction and fewer labour needed on site, compared to conventional construction methods
- Sustainability benefits throughout a building's lifecycle: timber has the lowest energy and water consumption of any building material and it is a renewable structural building material. Even at time of demolition, CLT is recyclable and can be reused.
- CLT also provides a higher level of thermal performance, reducing heating and cooling costs for occupiers.

Limitations/challenges of adopting CLT

- One possible limitation of using CLT in developments is the height of the building. The Forte (designed and built by Lend Lease in Melbourne, Australia) is 10 storeys high and is currently the tallest residential timber building in the world (for more information: www.forteliving.com.au).

- Analysing and testing is also being carried out to assess CLT's moisture control and performance management in the tropics, as well as designing it to meet local fire safety regulations and termite protection and treatment requirements

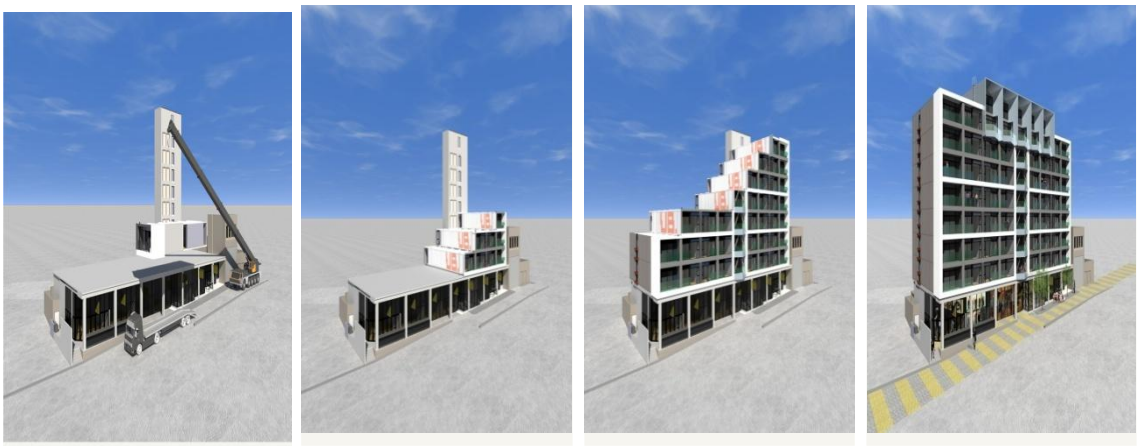
CLT in Singapore

In terms of regulatory clearance, CLT has already obtained In-Principle Acceptance from all the technical agencies for use in Singapore. However, its use is subject to certain conditions, such as the building height and design requirements.

Pre-fabricated Pre-finished Volumetric Construction

About Pre-fabricated Pre-finished Volumetric Construction

For pre-fabricated pre-finished volumetric construction (PPVC), complete flats or modules made of multiple units complete with internal finishes, fixtures and fittings are manufactured in factories, and are then transported to site for installation in a lego-like manner.



Benefits of PPVC

- PPVC can help to significantly speed up construction. For the Little Hero in Australia, the use of Unitised Building system (one form of PPVC) allowed the construction duration to be reduced by about 50%.
- Furthermore, dust and noise pollution can be minimised as more activities are done off-site.
- With the bulk of the installation activities and manpower moved off-site to a factory controlled environment, site safety will also improve.

Limitations/challenges of adopting PPVC

While the technology has been in use in other countries like Australia, developers might have some concerns on the long term implications of using PPVC (e.g. corrosion of steel), and there could be some resistance to the technology's adoption.

Technically, there is no reason why PPVC is any less maintainable compared to traditional buildings. To overcome these issues would require changing the mindset of the developers to move away from the traditional methods of construction and adopt the new technology to reap benefits in productivity and quality.

PPVC in Singapore

In terms of regulatory clearance, PPVC has already obtained In-Principle Acceptance from all the technical agencies for use in Singapore.

Nanyang Technological University plans to use PPVC in its new hostel project. When confirmed, it will be the first major high-rise development in Singapore to use this technology.

Factsheet on the Land Parcel for the Development of Integrated Construction and Precast Hub

Integrated Construction and Precast Hub

BCA had worked with various government agencies to formulate a masterplan for the development of multi-storey and higher density Integrated Construction and Precast Hubs (ICPHs), with land set aside on a longer 30-year lease term for direct allocation for precast and prefabrication uses.

To optimise the use of scarce land in Singapore, the ICPHs can be used to integrate the production of precast components with prefabrication and other related construction activities, all housed within a multi-storey complex. This will help to intensify the use of land set aside for ICPHs.

The longer lease land proposed under the masterplan would attract precasters to invest and achieve higher productivity with the application of automation and mechanisation in these hubs, while raising their production capacity to meet the increase in demand for precast concrete components.

Through the development of ICPHs, the landscape of the precast and prefabrication industry in Singapore would certainly change, with advancement in the introduction of automation and mechanisation in this industry, as opposed to the current situation of mostly open type of precast yards, thereby leading to higher construction productivity.

Comparison between open precast yard and ICPH

(A) **Factors**	(B) **OPEN PRECAST YARD**	(C) **ICPH** (D)
(E) Environment	(F) Housed in an open space	(G) Housed in an enclosed building
(H) Sound level (I)	(J) Noisy	(K) Quieter
(L) Cleanliness (M)	(N) Dusty	(O) Clean
(P) Set-up (Q)	(R) Low-Density	(S) Multi-storey
(T) Manpower requirements	(U) Labour-Intensive	(V) Highly mechanised

Benefits of ICPH

In traditional precast yards, employees have to work in the open which is prone to weather conditions. The ICPH is located in an enclosed building hence employees are able to work without being affected by the external environment.

ICPH can facilitate a higher degree of automation and mechanisation compared to open precast yards, hence less workers are required. It is estimated that half of the workers is only needed to double the capacity of the precast concrete production, as compared to traditional ways. Also, being housed in a multi-storey building allows the owners to monitor the processes and products more efficiently as their operations and functions located within a building.

Finally, the higher automation reduces dust and noise pollution compared to an open precast yard.

Land Parcel for the Development of Integrated Construction and Precast Hub

BCA is inviting tenders for the development of land parcel for the use of an ICPH.

(W) **Location**	(X) Kaki Bukit Road 4
(Y) **Site Area**	(Z) 20,000m^2 (approximately)
(AA) **Proposed Gross Plot Ratio**	(BB) 1.6 (maximum) / 1.4 (minimum)
(CC) **Proposed Building Height**	(DD) 64m AMSL
(EE) **Lease Term**	(FF) 30 years
(GG) **Mode of payment**	(HH) Lump Sum Payment

The tender is open to all precasters, contractors and precasters-contractors Joint Ventures (JV). Interested tenderers must develop the ICPH to house the production and storage of precast concrete components and the following construction-related activities:

(i) Prefabrication of components; and/or
(ii) Storage and maintenance of formwork; and/or
(iii) Storage and maintenance of construction plant, equipment and machinery; and/or
(iv) Others

As the predominant use of the ICPH is for precast concrete component production, BCA requires more than 50% of the Gross Floor Area (GFA) of the development to be set aside for precasting operations. The precast concrete component production operations (including concrete production, distribution and transportation) shall be automated or highly mechanised.

Tenders submitted will be evaluated based on a **Concept and Price** approach (2-Envelope system). The **Concept** proposal shall be evaluated according to the following criteria:
(a) Gross Plot Ratio,
(b) Investment,
(c) Production Facilities and
(d) Technical & Business Plan.

The above tender is launched on 31 July 2013 through GeBIZ, the procurement portal for the Government, ministries and departments of Government and statutory boards at www.GeBiz.gov.sg and will be open for 13 weeks. BCA will provide more details on the tender through a tender briefing session after the launch.