

BUILD SMART

A CONSTRUCTION PRODUCTIVITY MAGAZINE

NOV / DEC 2018

CHANGING THE WAY WE BUILD



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MECHANICAL, ELECTRICAL
AND PLUMBING (MEP)

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MULTI-LEVEL PRODUCTIVITY

Photo credit: Gammon Pte Ltd



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CEO'S MESSAGE

Dear Readers,

I am glad to report that we have made good progress in our transformation journey. The Construction Industry Transformation Map (ITM) launched in 2017 has provided our industry with a good focal point and given rise to new impetus to advance the built environment sector.

To build up workforce capabilities, representatives of our Trade Associations and Chambers, professional boards, institutes of higher learning (IHLs) and BCA came together as the Built Environment SkillsFuture Tripartite (BEST) Taskforce and formulated recommendations to enhance the existing IHL curriculum and internships, as well as training for professionals in the sector. Several new courses and guidebooks focusing on key areas of the Construction ITM were also introduced for individuals and firms to upgrade their skillsets and business models. For example, the guidebook for Prefabricated Mechanical, Electrical and Plumbing systems is featured in this issue. This is the third in the series of guidebooks relating to Design for Manufacturing and Assembly (DfMA).

Firms in the sector are also looking at venturing overseas and expanding their portfolio. One way to get there is to strengthen expertise in niche areas such as green buildings, DfMA and Integrated Digital Delivery (IDD). We also need a good knowledge and technology base to transform our work processes. As such, our sector is ramping up research and innovation efforts in robotics, automation as well as in integrated platforms for better collaboration and digitalisation. More Integrated Construction and Prefabrication Hubs (ICPHs) are also being developed to bring the supply of DfMA components nearer to home. To stay ahead of the competition, firms can also team up to leverage each other's strengths by embarking on projects together through collaborative bidding.

Our sector has accomplished much in 2018. This would not have been possible without the strong support from leaders and stakeholders in the sector. I would like to also take this opportunity to thank you for your valued readership for the Build Smart magazine series. We will embark on a new format for our BCA publications come 2019. I look forward to sharing each and every one of your success stories on our transformation journey.

Mr Hugh Lim
Chief Executive Officer
Building and Construction Authority



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digital!



Please subscribe to the e-version at
<https://www.bca.gov.sg/Publications/BuildSmart/buildsmart.html>
to stay up to date on the latest productivity news in
the industry.

ALL ABOUT PREFABRICATED MECHANICAL, ELECTRICAL AND PLUMBING (MEP)

Find out how the adoption of this game-changing construction solution is gaining ground in Singapore.

Thanks to Design for Manufacturing and Assembly (DfMA) solutions, many building components in today's construction industry are prefabricated. Amongst these prefab solutions are MEP services. Conventionally, MEP components can only be assembled at the very late stage of construction. Different services have to be installed by different contractors who work in silo onsite. The last to the finish line, MEP works are typically carried out on extremely tight schedules and workmanship may sometimes be compromised due to the compressed timelines. However, prefabrication technology aims to change this.

With prefab MEP, most of the MEP construction work is done offsite in a controlled manufacturing environment before components are transported onsite for installation. With prefabrication, manpower and time needed to build, assemble and install MEP modules can be reduced by up to 70%¹. Worksites are safer, and there is less impact on the surrounding environment.

This special prefab MEP issue takes you into the world of the various types of prefab MEP solutions and their benefits. Discover best MEP practices of a few local companies and find out which prefab MEP systems you can adopt.

¹ Design for Manufacturing and Assembly (DfMA): Prefabricated Mechanical, Electrical and Plumbing (MEP) Systems Guidebook https://www.bca.gov.sg/cpc/others/MEP_Guidebook_final.pdf

In this Issue...

- Success stories from builders who have adopted prefab MEP
- Four of the most versatile prefab MEP systems that can change the way you build

SIMPLY FABULOUS!

Prefab MEP modules bring many benefits in constructing systems such as air-conditioning ducts, electrical power supplies and water supply pipeworks.

Builders can expect:

Enhanced Quality Control of MEP Components

- Higher quality control is achieved as the modules are built in a controlled factory environment, and tested before being delivered onsite.

Improved Health & Safety Standards

- Construction sites are safer and more conducive as most of the work is done offsite.
- Builders spend less time working at height as scaffolding work to install MEP modules is kept to a minimum.

Better Productivity

- Instead of lifting multiple ducts and pipes, workers only need to lift one sub-assembly.
- Less manpower is required for module assembly.

Quicker Project Completion

- MEP works can be done earlier as MEP modules can be built offsite regardless of the progress of onsite construction works.
- Construction can be done faster as production of prefab MEP modules is carried out concurrently with onsite work.
- Installation of prefab MEP modules is easier and quicker as the entire sub-assembly is ready to be fixed upon arrival onsite.
- Common issues that typically stem from compressed timelines are reduced.

Minimised Impact on the Surrounding Environment

- Dust and noise pollution, as well as other disamenities to the surroundings are minimised.
- Construction waste is reduced as less rectification work is required.



Photo Credit:
Georg Fischer



Photo credits:
Balfour Beatty plc, Georg Fischer, Hyundai Engineering & Construction, and DSG Modular



CASE STUDY 1

SINGAPORE'S FIRST LARGE-SCALE PREFAB MEP PROJECT

Global Switch and its contractor tells us how prefab MEP contributed to the successful construction of the Global Switch Singapore Woodlands Data Centre.



It's the first in Singapore to adopt prefab MEP on a large scale. The **Global Switch Singapore Woodlands Data Centre** deployed about 350 MEP modules, all prefabricated offsite, reaping higher quality control, big savings on manpower and construction time with improved standards of safety.

Global Switch is one of the world's leading data centre providers. When it was planning to develop its second data centre in Singapore, the company had one key requirement – for the high-quality building to be completed within a short construction period.



MR SAM LEE
Managing Director
Global Switch Singapore

DEVELOPER

REAPING THE BENEFITS OF PREFAB MEP

**High Quality Control and 70% Manpower Savings
on trade level and Zero Reportable Health & Safety Cases**

Global Switch selected Gammon Pte Ltd which proposed a shorter build programme than most contractors during the tender period. Gammon's stand-out proposal was supported by various prefabrication solutions, including prefab MEP technologies.

"We decided to select Gammon based on its holistic prefabrication proposal including structural and MEP systems, which shortened the project period by at least 10%," says Mr Sam Lee, Managing Director at Global Switch Singapore.

Some of the benefits Global Switch observed throughout the project were better health and safety standards. For example, prefab MEP reduced the need to work at height, amongst other safety improvements.

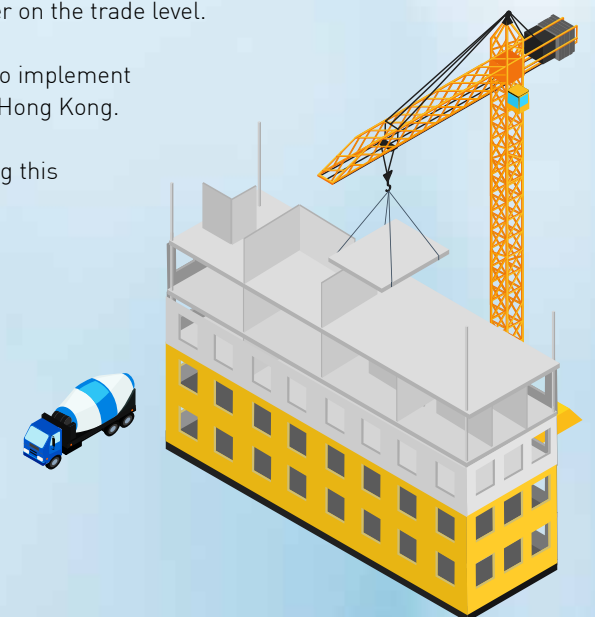
"We had no reportable cases for health and safety during the whole construction period," says Mr Lee.

Better-quality prefab MEP modules also improved the productivity – the prefab factory's quality control protocol ensured that modules sent onsite were of good quality. This reduced instances of costly delays in construction that could potentially arise due to damaged modules.

Global Switch also saw about 70% savings in manpower on the trade level.

Today, Global Switch continues to work with Gammon to implement similar prefabricated processes into its new project in Hong Kong.

"We see the benefits of prefab MEP and will be adopting this technology for our future projects," says Mr Lee.



CASE STUDY 1



CONTRACTOR

GAME ON FOR LATEST TECHNOLOGIES

In September 2016, the Gammon team got to learn more about prefab MEP systems on a prefab working trip to the UK. Upon returning to Singapore, it took action to adopt such systems in its projects. This very initiative was instrumental in the team winning the tender for the Global Switch Singapore Woodlands Data Centre project.



MR TAN HEE WEE
Executive Director
Gammon



An example of prefab MEP horizontal ceiling modules



An example of header and pump modules in the chiller pump room

Photo credit: Gammon



MAKING MORE BIMPACT WITH PREFAB MEP

How BIM played a role in helping Gammon win its client over and refine Prefab MEP works.

Traditionally, MEP works are carried out after structural works, resulting in extremely tight deadlines for MEP fittings. The adoption of prefab MEP methods helped the Gammon team to get around this issue and reduce construction period by at least 10%.

"This modular method enabled us to start Mechanical & Electrical works very early in the project, and simultaneously with onsite structural and architectural works," says Mr Tan Hee Wee, Executive Director at Gammon Pte Ltd.

One key enabler for the adoption of prefab MEP for the team, says Mr Tan, is Building Information Modelling (BIM).

"It is best to have good BIM coordination at the initial phases of the project – as early as the design stage. At this stage, the MEP modular design should be firmed up so that space and design requirements for structural and architectural elements can be planned in advance," Mr Tan adds.

BIM visualisation was also instrumental in helping the Gammon team to showcase the benefits of prefab MEP to its client – and eventually, win the building contract.

"We were able to show Global Switch exactly how the modular approach could help speed up the construction process," explained Mr Tan.

MEP BIM continued to ease the team's work processes, from the design to construction stage.

"During the planning process, implementing BIM into our prefab MEP planning enabled us to better plan construction sequences; and access to, lifting, delivery and installation of prefab MEP modules," he adds.

While it was a successful project, the team did encounter some challenge as prefab MEP was still a relatively new concept.

"Conventionally, MEP work is carried out based on physical site measurement. Using BIM to visualise and plan MEP measurements was an unfamiliar concept. It took us some time to change the mindset of some project stakeholders but we have put together a good BIM team and demonstrated the tremendous benefits in terms of service coordination, project schedule management, material management and more", says Mr Tan.



CASE STUDY 2

SPRINGING A SKYSCRAPER AT RAFFLES PLACE

The upcoming 51-storey CapitaSpring has innovative beginnings, right from the project's tender stage. CapitaLand and its contractor tell us more about their prefabricated MEP journey.



CapitaSpring is Singapore's first integrated development to adopt prefabricated MEP services, with MEP modules prefabricated in an offsite factory. When completed in the first half of 2021, it will be one of the tallest and greenest buildings in Raffles Place. With such a large-scale construction in the heart of the Central Business District, the team needed to look at solutions that could enable the building to be constructed more efficiently, and with minimal impact on the surroundings.



THE DEVELOPER THAT STARTED IT ALL

CapitaSpring has set high standards for innovation from the start, as CapitaLand values innovation and is committed to adopting the latest building technologies.

CapitaLand is one of Asia's largest real estate companies. Headquartered and listed in Singapore, it owns and manages a global real estate portfolio comprising integrated developments, shopping malls, lodging, offices, homes, real estate investment trusts and funds.

In line with CapitaLand's commitment to adopt the latest building technologies for productivity gains, the construction process will see the introduction of new systems, initiatives and programmes. It will be the first integrated development in Singapore to adopt prefabricated MEP modules, targeting to improve site productivity, workmanship and safety.

Engaging builders and specialists proficient in cutting-edge building technologies was CapitaLand's intention from the very beginning.

To spur innovation, CapitaLand took into consideration new initiatives as part of its tender evaluation for CapitaSpring, encouraging builders to think out of the box and consider new technologies.

"We are driven by our quest for innovation and are always committed to adopting technologies to enhance productivity gains," explains Mr Gregory Chua, Project Director for CapitaSpring, who also leads CapitaLand's team in looking at innovative building and construction technologies.

"We wanted to encourage builders to think out of the box and propose new technologies," says Mr Chua. CapitaLand selected Dragages Singapore Pte Ltd, which proposed prefabricated MEP as one of the construction technologies to enhance onsite productivity and safety.

"Prefabricated MEP consists of various trades which have to be closely coordinated to ensure smooth integration of services. Engaging builders and their specialists during the tender stage helps us better integrate prefabricated MEP with architectural and structural design, as well as project management planning," he elaborates.



CASE STUDY 2



THE CONTRACTOR THAT SPEARHEADED PREFAB MEP

Significant improvements in productivity for MEP module installation are expected.

Dragages Pte Ltd is one of the pioneers in Singapore's construction industry, with a good track record of spearheading new construction techniques and technologies. The company prides itself on its continual search for new ways to innovate and improve its processes, as well as manage risk.

After winning the CapitaSpring contract, Dragages took quick action to strengthen its knowledge in the relatively new concept of prefab MEP. It went on a prefab MEP learning journey to the UK with the rest of the project team including the CapitaLand team, the consultants and Mechanical and Electrical (M&E) sub-contractors. The team members learnt more about prefab MEP from their overseas counterparts, so they could adapt prefab MEP to the Singapore context. One week upon returning to Singapore, the team did up its first horizontal MEP mock-up.

"With prefab MEP, manpower and time needed for onsite construction will be significantly reduced. The worksite will also be safer as the prefab MEP modules will be fabricated offsite before being sent onsite for assembly."

"We expect significant improvements in productivity in areas of MEP installation where the MEP modularisation system has been applied," says Mr Eric Man, Head of M&E at Dragages.



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FOR FURTHER DETAILS, PLEASE CONTACT:

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This Master of International Construction Management degree with a Major in Construction Productivity is designed to enable working professionals to expand and improve their skills in managing construction projects in international markets, and develop competencies in the latest construction productivity methodologies. This program is intended for working professionals who are making vital business decisions and have the potential to be future leaders who will guide the construction industry in attaining even higher levels of excellence.

WORLD WORKPLACE ASIA CONFERENCE 2019



Venue: Marina Bay Sands, Singapore

Building the Future of Facility Management Through Digital Innovation

SAVE THE DATE

This year's conference will be looking at technology's role in our society and the business of FM with a focus on digitalisation.

Recognised as the preminent platform for dialogue on facility management issues and trends in the Asia Pacific regions, World Workplace Asia Singapore 2019 offers a fitting opportunity for companies and stakeholders to present their products and services directly to key decision makers of the facilities management (FM) and real estate industries.

We invite you to support our drive to develop the FM industry by becoming a sponsor of this international event.

JOIN US at WWA 2019 (Singapore) from **3rd - 5th April 2019**

For sponsorship and event enquiries, please contact Ms Grace Teo.

Tel: 6248 9834 Email: Grace_Teo@bca.gov.sg

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BOOST YOUR CONSTRUCTION EFFORTS WITH PREFAB MEP TECHNOLOGIES

See some of the most versatile game-changing prefab MEP innovations that have helped builders and contractors in Singapore work better, faster and safer.

TECHNOLOGY SHOWCASE 1: PUMP SKIDS

These mechanical pumps are pre-installed with pumps, piping, control panels and other services before being delivered onsite.

Where can Pump Skids be Applied?

- Pumps for Air-conditioning Systems
- Plumbing and Sanitary Systems
- Fire Protection Systems

Why Use Pump Skids?

- Faster Pump Installation
- Construction and fabrication period of pumps is reduced, helping to speed up the overall construction process.

More Manpower and Time Savings

Man-days and man-hours spent on onsite installation can be reduced. In a project undertaken by Swee Hup Engineering Resources Pte Ltd, man-days and man-hours were reduced by 71%.



Photo Credit: CAE Engineering Pte Ltd

TECHNOLOGY SHOWCASE 2: MECHANICAL COUPLINGS

Piping work typically involves using welds and flanges. Mechanical pipe couplings enable builders to join pipes without using welds and flanges, bringing along significant productivity improvements and time savings.



Photo Credit: Victaulic Company

Where can Mechanical Couplings be Applied?

- Rainwater Drainage Systems
- Gravity Foul Water & Vents
- Pumped Drainage Systems
- Boosted Cold Water Systems
- Chilled Water Systems
- Hot Water Systems
- District Heating/Cooling Systems
- Dry Risers

Why Use Mechanical Couplings?

More Efficient Work Processes

Traditionally, flanges have to be welded to the pipe and then bolted together. The mechanical pipe couplings innovation eliminates the need for hot work permits, which eases the construction process.



Greater Flexibility

Unlike conventional flanged joints which are rigid, mechanical pipe couplings are flexible, enabling more movement in pipework. Mechanical pipe couplings also allow for expansion and contraction in pipework, while conventional flanged joints have to be fixed with bellows and expansion loops.

Easier Pipe Preparation

Mechanical pipe couplings join two plain ended pipes together without the need for special pipe preparation. This saves builders more time compared to conventional flange welding, which requires cleaning of paint/oil/grease before pipes can be joined.

TECHNOLOGY SHOWCASE 3: BUSBAR TRUNKING SYSTEM

Electrical power is conventionally distributed via cables. The busbar trunking system eases the distribution process. Copper or aluminium busbars are placed in a suitable enclosure, offering them a high level of protection from damage by foreign bodies.

Where can Busbar Trunking Systems be Applied?

- Rising Mains
- False Floors
- False Ceilings
- Service Shafts
- Transformers
- Main Switchboards



Photo Credit: EP Engineering Pte Ltd



Why Use Busbar Trunking Systems?

More Space Saving

Busbars have a compact design where compressed flat conductors can pass through their enclosures. The system takes up very little space in the building – significantly less than conventional cabling systems. This is extremely beneficial for buildings that require high volumes of electricity to be transmitted. Busbars can also be installed within highly-limited spaces such as switchboards.

Increased Cost and Time Savings

Busbar trunking can be installed anytime during the building process, unlike conventional cabling which can only be installed at one of the last stages of

construction. This optimises onsite work and allows unexpected events to be anticipated in advance. Busbar trunking, being a factory-tested solution, reduces the time and manpower needed to inspect connections.

Enhanced Flexibility

As businesses grow, so will the need for new electrical circuits. The busbar trunking system enables builders to enjoy greater flexibility in terms of future upgrades or modifications. In addition, relocation or replacement of load equipment can be carried out quickly, without de-energising the supply trunking or shutting down operations.

TECHNOLOGY SHOWCASE 4: PRODUCTIVE PIPING SYSTEMS

These include piping systems such as pre-insulated plastic pipes, mechanical pipe couplings and flexible multi-layer piping systems with push-fit detachable connections.

Where can Productive Piping Systems be Applied?

- Potable Cold and Hot Water Systems
- Chilled Water Systems



Photo Credit: Daikin Airconditioning Singapore

Why Use Productive Piping Systems?

Shorter Installation Time

Because most of the work is done offsite, onsite installation time can be cut by over 50%.

Ease of Maintenance

Such piping systems with detachable fittings and standard accessories that simplify the maintenance/ replacement work, resulting in time savings of up to 60%.

Less Labour Required

Costs incurred by onsite labour can be reduced by up to 50%.

Longer Lifespan

Pipes can last longer due to minimal pipe corrosion.



Photo Credit: Aquatherm



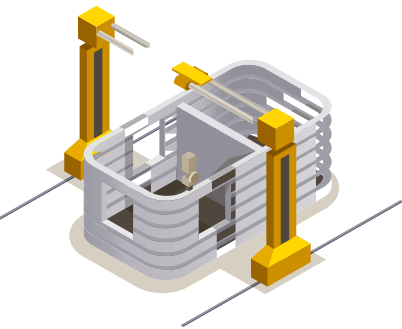
Photo Credit: Aquatherm



Photo Credit: Sintalow Hardware Pte Ltd

DFMA IS THE WAY FORWARD!

Integrated Construction and Prefabrication Hubs (ICPHs) are set to put the built environment industry on the road to more productivity breakthroughs.



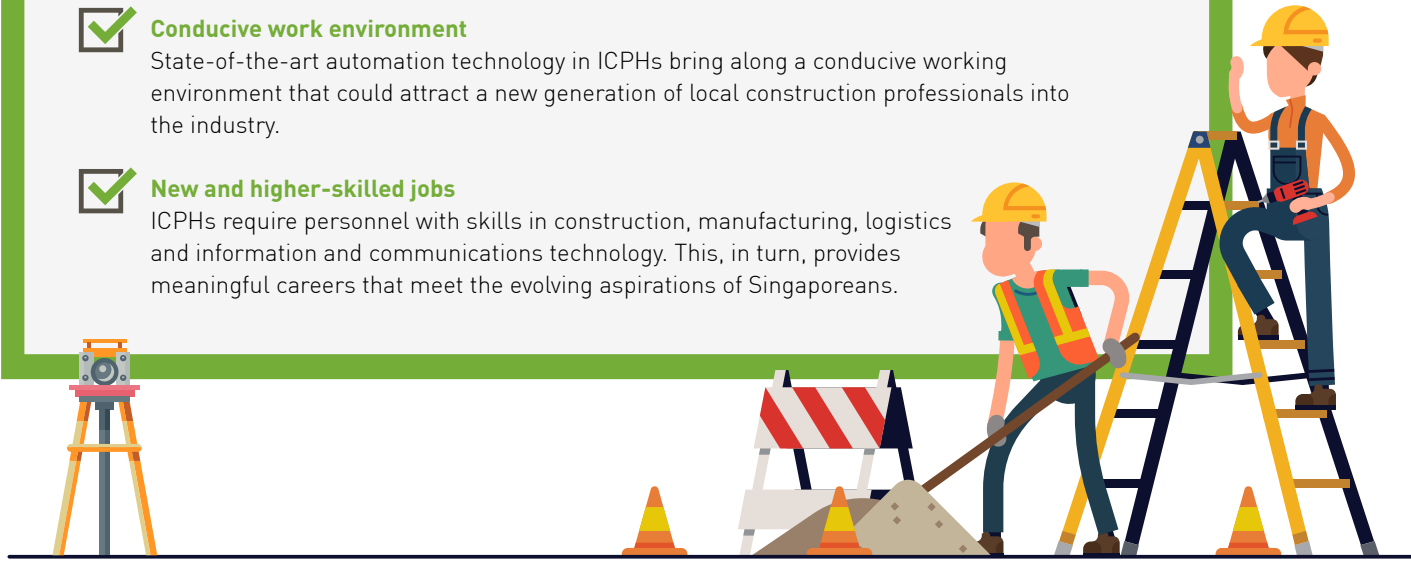
Design for Manufacturing and Assembly (DfMA) is the key to increasing construction productivity and improving construction quality. As the built environment sector faces growing manpower challenges and high expectations of construction quality, the DfMA approach is leading the transformation of the built environment sector through leveraging advanced technology, improved quality and precision of construction while reducing the reliance on manpower and ultimately, higher productivity.

In building up a highly productive construction sector while optimising the use of land in Singapore, BCA has worked with the industry to launch ICPHs. These are multi-storey advanced manufacturing facilities capable of producing a wide spectrum of prefabricated components, including precast concrete components, Prefabricated Bathrooms Unit (PBU), Prefabricated Prefinished Volumetric Construction (PPVC) modules, and Prefabricated Mechanical, Electrical and Plumbing (MEP) systems. In a controlled factory environment, ICPHs are not only highly productive but also deliver high-quality prefabricated components. These hubs can also be used for related construction activities such as storage of formwork, construction equipment, and workers' dormitories.

BENEFITS OF ICPHS

Besides optimising land use and enhancing productivity and quality, ICPHs also bring along the following advantages to the Built Environment in Singapore:

- ✓ **Minimised disamenities on site**
Well-planned and factory-controlled prefabricated components minimise re-works on site which might otherwise cause disturbance to the neighbourhood. The reduced number of deliveries of prefabricated components compared to cast-in-situ work also minimises disamenities on site.
- ✓ **Conducive work environment**
State-of-the-art automation technology in ICPHs bring along a conducive working environment that could attract a new generation of local construction professionals into the industry.
- ✓ **New and higher-skilled jobs**
ICPHs require personnel with skills in construction, manufacturing, logistics and information and communications technology. This, in turn, provides meaningful careers that meet the evolving aspirations of Singaporeans.



SPOTLIGHT ON GREYFORM ICPH

- Built by:** Greyform Pte Ltd (A member of Straits Construction Group)
- Location:** Kaki Bukit
- Launch Date:** 3 October 2017
- Capabilities:**
- Automated production processes e.g. concrete distribution and pallet circulation systems, and welded steel reinforcement
 - 3D moulds for PBUs
 - Prefabricated Kitchen Units (PKUs)
 - Automated multi-tier racking system for storage of prefabricated components
 - BIM for design and manufacturing of prefabricated components



Greyform is Singapore's third ICPH. This facility builds on digital modelling and houses highly automated production processes. It drives production with precision in areas such as design using BIM, production planning, storage of prefabricated components, and delivery scheduling, all within the comfort of a clean and air-conditioned control room.

Since its official opening, Greyform has rapidly gained reputation and market share in supplying quality PBUs. It has bagged six precast projects and 16 PBU projects from both public and private developers for diverse development types including residential, commercial, industrial and healthcare projects.

Greyform has also added precast production capacity overseas as part of its growth strategy. It is working towards capitalising on growth opportunities, bringing its professional services and products regionally and beyond.

BCA targets to launch up to 10 ICPHs by 2020-2023 to meet the industry's demand for DfMA components in the years ahead.



NO.	DATES	EVENT	VENUE	ORGANISER	CONTACT PERSON & DETAILS
1	7, 8, 14, 15, 21, 22 & 28 Jan 2019 (7 evenings)	CFD Simulation using Open Source Software NEW	BCA Academy, 200 Braddell Road	BCA Academy	Customer Services Tel : 62489999 email: bca_academy@bca.gov.sg
2	9 Jan / 20 Feb 2019 (pm session)	Basic Concept in Construction Productivity Enhancement (BCCPE) (63rd & 64th Run)			
3	9 Jan 2019 / 20 Feb 2019	Refresher Course for Licensed Electrical Workers (Technician/Engineers) (46th & 47th Run)			
4	10, 11, 17 & 18 Jan 2019	Certification course in BIM Modelling (Architecture Track) (20th Run)			
5	14 Jan 2019	BCA-REDAS Built Environment and Property Prospects Seminar 2019 NEW	Grand Copthorne Waterfront Hotel	BCA-REDAS	
6	17, 18, 21, 22 Jan & 15 Feb 2019	Certification Course for Green Mark Manager (78th Run)	BCA Academy, 200 Braddell Road	BCA - IFMA	
7	22-Jan-2019	Good Industry Practices – Waterproofing for Internal Wet Areas (Re-run)			
8	24 & 25 Jan 2019	Developing a Lifting Plan for Crane Lifting Operations (4th Run)			
9	25 Jan 2019	Application for Temporary Occupation Permit/Certificate of Statutory Completion (7th Run)			
10	30 Jan 2019	Good Industry Practices – Marble/Granite/Ceramic Tiling (Re-run)			
11	20 & 21 Feb 2019	Construction Contract Drafting & Dispute Resolution (2nd Run)			
12	25 Feb 2019, am	Building Control Regulations for Site Supervisors (54th Run)			
13	25 – 28 Feb 2019	Certification course in BIM Modelling (MEP Track) 19th Run			
14	26 Feb 2019	Good Industry Practices – Drywall Installation including Wet Areas Application (13th run)			
15	26 Feb 2019 – end of Aug 2019	Certification Course for Green Mark Facilities Professional (2019 – Batch 6) (GMFP consist of 6 CORE & 2 ELECTIVE MODULES)			
16	18 – 21 Mar 2019	Certification course in BIM Modelling (Structure Track) (14th Run)			
17	21 Mar 2019 – 1 Oct 2019	Certification Course for Green Mark Professional (Revamp) (2019 – Batch 7) (GMP consist of 6 CORE & 2 ELECTIVE MODULES)			
18	3 – 5 Apr 2019	WORLD WORKPLACE ASIA CONFERENCE 2019	Marina Bay Sands	BCA - IFMA	
19	Starting on 7 Jan 2019 Registration closing on 28 Dec 2018	Specialist Diploma Building Cost Management - 2019 Module A			
20		Specialist Diploma Construction Management - 2019 Module A			
21		Specialist Diploma in Facility & Energy Management - 2019 Module A			
22		Specialist Diploma Construction Management - 2019 Module A			
23	Starting on 8 Jan 2019 Registration closing on 28 Dec 2018	Specialist Diploma in Facility & Energy Management - 2019 Module A			
24		Specialist Diploma in Construction Productivity (10th Intake)			
25	Starting on 14 Jan 2019 Registration closing on 28 Dec 2018	Specialist Diploma in Building Information Modelling (21st Intake)			
26	Starting on 19 Feb 2019 Registration closing on 1 Feb 2019	Specialist Diploma in Lean Construction (5th Run)			
27		Specialist Diploma in MEP Modularisation NEW			
28		Specialist Diploma in Computational BIM (Building) NEW			
29		Specialist Diploma in Design for Manufacturing & Assembly (6th Intake)			
30		Specialist Diploma in Lean Construction (5th Intake)			
31		Specialist Diploma in MEP Modularisation (2nd Intake)			
32		Specialist Diploma in Virtual Design & Construction (5th Intake)			
33	(Full-time - 12th Intake) Starting on 25 Feb 2019 Registration closing on 1 Feb 2019	Bachelor of Construction Management (Building)(Honours)_FULL TIME (awarded by The University of Newcastle, Australia)	BCA Academy, 200 Braddell Road		BCA - University of Newcastle
34	(Part-time - 6th Intake) Starting on 2 Apr 2019 Registration closing on 8 Mar 2019	Bachelor of Construction Management (Building)(Honours)_PART TIME (awarded by The University of Newcastle, Australia)		Ms Bernice Ang (Programme) / Ms Elaine Chow (Enrolment) Tel: 62489944 / 67304528 email: bernice_ang@bca.gov.sg / elaine_chow@bca.gov.sg	
35	(Full-time - 3rd Intake) (Accelerated Pathway) Starting on 2 May 2019 Registration closing in 1 Apr 2019	Bachelor of Civil Engineering (Honours)_FULL TIME (awarded by The University of Newcastle, Australia)		Er Lim Yaw Shyan (Programme) / Ms Ang Geok Lung (Enrolment) Tel: 62489915 / 6248 9887 email: lim_yaw_shyan@bca.gov.sg / ang_geok_lung@bca.gov.sg	
36	(Part-time - 2nd Intake) Starting in Aug 2019 Stage 1 application closing: 15 Feb 2019	Master of International Construction Management with major in Construction Productivity (awarded by the University of Florida)		BCA - University of Florida	Mr Loo Kian Wei (Programme) / Ms Saraswathy (Enrolment) Tel: 6730 4427 / 6248 9968 email: Loo_Kian_Wei@bca.gov.sg / saraswathy_ramachandran@bca.gov.sg



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(HONOURS)

Next Intake: June 2019

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OVER 90%

of our research is 'at or above world standard'³

TOP 1%

universities in the world¹

TOP 10

in Australia for research income⁴

TOP 8

in Australia for research 'well-above world standard'³

¹ QS World University Rankings 2017/18

² QS World University Rankings by Subject, 2017

³ Excellence in Research Australia 2015

⁴ Higher Education Research Data Collection 2014

Civil Engineers are highly demanded in Singapore. In fact, Civil engineering is vital to Singapore's drive to creating a better built environment and liveable city. The development of mega infrastructure projects as well as re-shaping Singapore's city landscape will require highly qualified engineers trained in civil discipline. As we build higher and dig deeper underground, there is high prospects for Civil Engineers* to design, plan, build, manage and oversee the development of infrastructure/building projects. This degree programme is designed to allow both GCE 'A' level and diploma graduates a pathway to pursue a rewarding career in the built environment.



BACHELOR OF CONSTRUCTION

MANAGEMENT (BUILDING) (HONOURS)

Every construction project combines a variety of complex challenges. The Bachelor of Construction Management (Building) (Honours) programme will equip you with the skills and knowledge to manage complexities in construction projects in Singapore and across the world. The programme incorporates content of Building Information Modelling teaching and projects which offers a niche specialty beyond the construction management discipline.

Graduates from the programme will embark on a diverse and exciting career opportunities to be employed as BIM Manager, Construction Manager, Project Manager, Quantity Surveyor, Facilities Manager, Property Developer and self-employed Consultant.

Next Intake: February 2019

STUDY MODE	COMMENCEMENT DATE	APPLICATION CLOSING DATE
Full-Time (12th Intake)	25 February 2019	1 February 2019
Full-Time (13th Intake)	2 April 2019	8 March 2019
Part-Time (6th Intake)	2 April 2019	8 March 2019

FOR FURTHER DETAILS, PLEASE CONTACT

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For more information, please visit: www.bcaa.edu.sg

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BIM SERIES

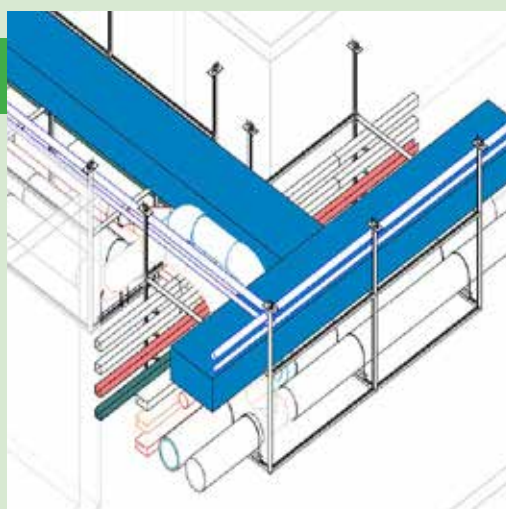
**5 MONTHS PART-TIME STUDY
+ 4 MONTHS PROJECT**

- Specialist Diploma in Computational BIM (Building)

NEW

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- Specialist Diploma in Building Information Modelling



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