The BCA Construction Productivity Award (CPA) recognise outstanding industry firms for going the extra mile to achieve construction productivity improvements and promote higher productivity in the industry.

There are two award categories:

- CPA – Advocates
- CPA – Projects
BCA Construction Productivity Awards

CPA – Advocates

The CPA – Advocates recognises outstanding developers, consultants, builders and subcontractors for their achievements in improving productivity at the firm level. Developers, consultants and builders are recognised for the adoption of designs, construction methods, processes and/or technologies that have significant productivity impact on their projects.

CPA – Advocates has four sub-categories:

i) Developer
ii) Consultant
iii) Builder (Open)
iv) Builder (Prime)

Assessment Criteria

1. Buildable design score
2. Constructability score
3. Productivity performance (physical and value-added productivity)
4. Productivity initiatives
City Developments Limited (CDL) is a long standing advocate for sustainability and high construction productivity in Singapore.

**KEY PRODUCTIVITY INITIATIVES**

- City Developments Limited (CDL) pioneered the use of PPVC for The Brownstone Executive Condominium in Sembawang. Building modules complete with finishes, fixtures and fittings are manufactured off-site in factories, then transported to the site for installation in a ‘Lego-like’ manner.

- The use of PPVC is expected to increase productivity by 40% as compared to conventional construction methods.

- Stringent quality control is also ensured as modules are fabricated in controlled factory conditions.

- Worksites are cleaner and safer as less construction debris is generated and fewer workers are required on-site.

The firm advocated the use of Prefabricated Prefinished Volumetric Construction (PPVC) for The Brownstone Executive Condominium, at Sembawang.
As Singapore’s lead government agency responsible for the development of industrial infrastructure, JTC pushes boundaries in innovation for construction productivity so as to respond quickly to evolving industry needs and overcome challenges such as manpower and resource constraints in today's fast-changing built environment.

**KEY PRODUCTIVITY INITIATIVES**

- The dormitory at **JTC Space @ Tuas**, was built with the Prefabricated Prefinished Volumetric Construction (PPVC) method instead of the conventional cast-in-situ concrete construction.

- Using the PPVC method has resulted in overall project time and manpower savings. In addition, with most of the structural, architectural and M&E (Mechanical and Electrical) works completed off site, the work site is cleaner and wastage is minimised.
KEY PRODUCTIVITY INITIATIVES

- JTC has also adopted productive construction materials at another award-winning project, **Block 81 at phase two of JTC LaunchPad @ one-north**.

- By pioneering the use of engineered wood like CLT and Glulam for Block 81, the overall project time was reduced and manpower saving was also achieved. There was also reduction of noise and dust generated by the construction project, thus minimising the impact on the LaunchPad community. The worksite was also cleaner and more organised.
MOH Holdings (MOHH) Pte Ltd is the holding company of Singapore’s public healthcare clusters comprising the National University Health System, National Healthcare Group and Singapore Health Services. Sharing the Ministry of Health’s vision to champion a healthy nation and ensure that our people live well, live long and with peace of mind, MOHH’s role is to enhance public healthcare sector performance by unlocking synergies and economies of scale.

**KEY PRODUCTIVITY INITIATIVES**

- WCNH was designed with the intent to locate areas which require larger column-free spans at lower 1st and 2nd cast-in-situ floors. Upper floors from 3rd to 9th storey are catered for the repetitive and modular layout which is designed in standard grid that facilitates prefabrication and the use of PPVC.

- There were 52 PPVC modules per floor amounting to a total of 343 PPVC modules for the entire project. The PPVC modules were fabricated off site in a controlled manufacturing environment and arrived on site fully furnished with mechanical, electrical and architectural finishes.
MOH Holdings Pte Ltd
Developer Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

KEY PRODUCTIVITY INITIATIVES

• YCH In-Patient blocks adopted the Precast Column Structural Steel system (PCSS) construction which resulted in significant on site productivity improvement along with other benefits such as better quality finish, reduced noise and dust pollution and a safer worksite.

• BIM was fully implemented from beginning of the design stage as a virtual platform for better visualization and communication among the various stakeholders. BIM was utilised to automate the detection of clashes between different trades such as electrical conduit or ductwork that run into beams. With the help of BIM, irregularities were discovered early and costly re-work was reduced.

Adopted the use of PCSS and BIM at Yishun Community Hospital (YCH)
Headquartered in Singapore, Surbana Jurong Pte Ltd was formed in June 2015 through the merger of Surbana International Consultants and Jurong International.

**KEY PRODUCTIVITY INITIATIVES**

- Surbana Jurong’s productivity strategy in holistic design and sustainability is manifested in this project; Compassvale Boardwalk. From a design perspective, beyond having repetitive block designs, each room facade is meticulously replicated to deliver cost effectiveness and efficient pre-casting during the construction stage.

- Building and Information Modelling (BIM) was also adopted when designing for precast construction in a collaborative physical and virtual environment.
Meinhardt, Asia’s largest independent engineering consultancy firm headquartered in Singapore, is renowned for value engineering which helps clients save time and money. A champion at improving productivity in Singapore’s construction sector, Meinhardt pioneered many innovative engineering firsts across a multitude of projects in Singapore for more than 40 years.

**KEY PRODUCTIVITY INITIATIVES**

- The construction of the SMU School of Law employed the use of multi-storey transfer steel trusses over the 1400-seater column-free basement function hall instead of the conventional reinforced concrete transfer structures. The use of steel structures, which were prefabricated offsite, greatly enhanced construction productivity and overall efficiency.
KEY PRODUCTIVITY INITIATIVES

- The design and adoption of robust top-down construction with minimal struts effectively controlled ground movements, enhanced site safety and improved productivity. This was carried out successfully for projects such as the SMU School of Law, Frasers Tower, Commonwealth Towers, etc.

- Building Information Modelling (BIM) was adopted extensively in Meinhardt’s projects. Extensive collaboration amongst project stakeholders effectively resolved clashes upfront in the design stage, effectively reducing re-work and improved on-site productivity.
Dragages Singapore Pte Ltd (DSPL) was established in Singapore in 1984, undertaking the construction of Newton MRT Station as their first project. DSPL is part of French Corporation Bouygues Construction, of which more than 1000 employees are based in Singapore.

**KEY PRODUCTIVITY INITIATIVES**

- DSPL employed the use of PPVC for the construction of a nursing home along Woodlands Rise. The PPVC modules were designed by engineers from DSPL.
Dragages Singapore Pte Ltd
Builder (Open) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

KEY PRODUCTIVITY INITIATIVES

- For the Venue Residences project, DSPL took the initiative to propose a peanut shape diaphragm wall during the tendering stage. One of the main advantages of the diaphragm wall was that it was faster to construct. In addition, the diaphragm wall forms an almost strut free system with only two primary concrete strutting beam, making it less labour intensive for setting-up and dismantling of the strutting system.

- DSPL also adopted BIM as part of core strategy to drive technical and productivity competitiveness. DSPL took the decision to adopt BIM in the Singapore Sportshub project for design, development, construction planning, and procurement. The use of BIM allowed for close coordination between the different stakeholders involved in the project.
Founded in 1992, Teambuild has grown to become an established local main contractor with a wide array of projects in both private and public residential projects, public upgrading projects as well as institutional, commercial and industrial projects.

Teambuild, has over the years won various accolades and awards for her construction and safety excellence. Teambuild is now in the forefront of pushing for higher productivity through the use of Prefabricated Pre-finished Volumetric Construction (PPVC).

**KEY PRODUCTIVITY INITIATIVES**

- Teambuild adopted the use of concrete Prefabricated Pre-Finished Volumetric Construction (PPVC) at The Brownstone EC; the first private residential project to adopt PPVC. Although such construction method was initiated by the developer, the builder provided value-added engineering solutions to ensure early completion despite challenges on site.
Teambuild Engineering & Construction Pte Ltd
Builder (Open) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

KEY PRODUCTIVITY INITIATIVES

- Teambuild also embarked on the development and construction of its own Integrated Construction Prefabrication Hub (ICPH). Teambuild’s ICPH will be fitted with fully automated and integrated vertical production and automation storage and racking systems. This will facilitate the development and manufacturing of PPVC modules locally, cutting down on transportation and further reduces the manpower needed.
Kajima Overseas Asia Pte Ltd (“KOA”) is a subsidiary of Kajima Corporation (“Kajima”), one of Japan’s largest construction and civil engineering general contractors.

Kajima in Asia has its regional office in Singapore, which was established in 1988.

**KEY PRODUCTIVITY INITIATIVES**

- The Precast Lotus Root System (PLRS) eases complicated connection joints with the integration of beam and column. It is much simpler and faster to install on site compared with other precast system and cast in-situ. The construction of vertical elements can proceed without waiting for the slab to be cast. This improves the cycle time and buildability of the building and helps in conserving the use of construction materials. It also gives a better quality structure and helps promote an environmentally-friendly construction site.

Adopted the use of the Precast Lotus Root System
Kajima Overseas Asia Pte Ltd
Builder (Open) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

GOLD

KEY PRODUCTIVITY INITIATIVES

• Kajima developed a new method of Hollow Core Slab (HCS) construction. In the conventional method of constructing HCS, the steps are:
  1. Erecting the temporary formwork
  2. Casting & curing of the supporting beam
  3. HCS is laid over the beam
  4. Casting of the topping-up concrete slab

• KOA’s new method involved 3 steps only as a result of one-time casting of the topping-up concrete slab with the RC beam.

• With the new method of HCS construction, it only takes 7 days to complete a 100m² HCS (instead of 12 days), thereby reducing the construction cycle by 5 days.

Developed a new method of Hollow Core Slab (HCS) construction
Proposed the use of Drainage Blanket in lieu of Tension Piles

KEY PRODUCTIVITY INITIATIVES

- The construction of Mediacorp’s new media complex at Mediapolis @ One-North faced a challenge during the design stage because the building sits in a land with high ground water table.

- Originally, 319 nos. of 1200mm diameter RC piles were required. As an alternative, KOA proposed using a Drainage Blanket System in lieu of the tension piles. This alternative solution significantly reduced the amount of manpower required.
Kimly Construction Pte Ltd
Builder (Open) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

Founded in 1965, Kimly Construction is one of the more progressive construction companies in Singapore. Kimly Construction works hand-in-hand with their trusted partners to deliver projects safely, efficiently and on schedule.

Kimly Construction progressively moves ahead by adopting technologies that improve construction productivity.

KEY PRODUCTIVITY INITIATIVES

• The Mobile Battery Mould (MBM) is the world’s first vertical battery mould with mobility. Kimly Construction procured the MBM from Germany in 2014 to improve the productivity of on-site precasting.

• The MBM alleviated space and logistical constraints on site and facilitated the setting up of an on-site precast and storage yard. The project team carried out detailed construction and production planning to achieve just-in-time production with the MBM.

Mobile Battery Mould (MBM) used for On-site pre-casting
Kimly Construction Pte Ltd
Builder (Open) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

KEY PRODUCTIVITY INITIATIVES

- Kimly Construction was one of the pioneers in the adoption of BIM. Kimly Construction has an in-house team of trained BIM specialists. The adoption of BIM allowed for early detection of site issues such as clashes which prevented costly re-work. BIM also allowed for accurate quantity take-off, site utilisation and tower crane planning, precast planning and visualisation, technical coordination and shop drawing production.
Straits Construction Singapore Pte Ltd was founded in 1969 and secured its first public housing construction project at Serangoon Avenue 4. The company has since grown from strength to strength.

**KEY PRODUCTIVITY INITIATIVES**

- Straits Construction has three on-going projects that adopted the use of virtual design and construction (VDC), namely, Blossom Spring @ Yishun (YSN4C17), City Vue @ Henderson (BMRC53) and Sophia Hills @ Mount Sophia.

- The adoption of VDC brought about advantages and benefits such as smoother and more productive MEP co-ordination. A BIM repository was also created for purposes such as actual construction, progress monitoring, etc.
KEY PRODUCTIVITY INITIATIVES

Straits Construction also developed several innovative solutions to boost site productivity. These solutions came in the form of software applications which are accessible through mobile devices. They include the following:

- Electronic permit-to-work (e-PTW)
- Defect Inspection and Rectification Management (DIRM)
- Sub-Contractors Defect Rectifications Management System (SDRM)
Gammon Pte Ltd focuses on Building, Foundation, M&E Works and Rail (Sleeper replacement works).

**KEY PRODUCTIVITY INITIATIVES**

- During boring operations, a commonly encountered problem is the dislodging of the boring tools such as auger, boring bucket, core barrel, cleaning bucket from Kelly bar into deep bored holes. Gammon brainstormed and came up with a solution by developing a recovery tool.

Developed a tool for the recovery of boring tools
Gammon Pte Ltd
Builder (Open) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

Pioneered the use of Road Rail Vehicle (RRV) for Sleeper Replacement

Pioneered the use of Zero G Mechanical Arm

KEY PRODUCTIVITY INITIATIVES

- The conventional method of sleeper replacement involves manually handling and removal of sleepers in the case of timber sleepers. Gammon proposed an alternative method of sleeper replacement by using a special equipment called the Road Rail Vehicle (RRV).

- The Zero G mechanical arm enables tools to be mounted to any supporting frames. This allows tools, parts and other payloads to be maneuvered as if weightless. There is complete freedom of motion – providing its users with a level of performance that is unmatched by crane-based systems, torque arms and tool balancers. By eliminating the strain and fatigue associated with repetitive tasks and making tools effectively weightless, ZeroG technology can significantly boost productivity, reduce injury costs, and improve quality.
Gammon Construction Limited Singapore Branch has involved in constructing a number of key civil engineering projects in Singapore for many years.

**KEY PRODUCTIVITY INITIATIVES**

- Gammon Construction Limited Singapore Branch pioneered the use of carpet reinforcement in Singapore. Carpet reinforcement is a prefabricated roll of steel reinforcement bars bound together by steel wires. This roll of reinforcement bars are then rolled up to form a carpet reinforcement bundle. Carpet reinforcement was utilised for the construction of the roof slab at Mayflower Station.
Gammon Construction Limited Singapore Branch
Builder (Open) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

KEY PRODUCTIVITY INITIATIVES

- Gammon Construction Limited Singapore Branch pioneered the use of the Concrete Canvas in Singapore. Concrete Canvas (CC), is a flexible, durable, water proof and fire resistant concrete layer. The system is used for the slope protection in temporary retaining works.

- Gammon Construction Limited Singapore Branch also adopted the use of Digital automation. Digital automation uses a paperless web and app based system that allows a seamless application and approval of site inspections and safety permits. The signatures are authenticated digitally and the approved inspections and permits can be downloaded anytime from cloud.
Based in Singapore, DLE M&E Pte Ltd has over 35 years of experience in mechanical and electrical engineering services. Previously known as Double Lion Electrical Pte Ltd, DLE is a one-stop integrated M&E contracting firm with the highest BCA grading of L6 in electrical, air-conditioning, refrigeration and ventilation works as well as integrated building services workheads.

**KEY PRODUCTIVITY INITIATIVES**

- DLE has adopted the use of BIM/VDC to effectively manage projects. An ICE space was setup to enhance collaboration between various stakeholders including subcontractors.

- DLE also actively participates in grooming the next generation by offering various scholarship and sponsorship programmes.
Lightrus Pte Ltd
Builder (Prime) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

Lightrus is a construction technology firm that specialises in the use of Light Gauge Steel (LGS) for the construction of buildings.

**KEY PRODUCTIVITY INITIATIVES**

- LGS can be adopted as prefabricated structural systems in low-rise buildings such as landed houses, shop houses and town houses.

- Lightrus Prefab System enables connections to be made through the use of cold joints such as rivets, self-drilling screws or anchor bolts. This simplicity of using only battery drills and power drills for connections effectively improved site productivity.

- 3D modelling was also adopted to aid in visualising the construction designs. Through the adoption of 3D modelling, Lightrus was better able to enhance communication of construction plans and designs with the various project stakeholders. Design clashes between architectural, structural and M&E were easily identified, communicated and rectified.
Tong Hai Yang Pte Ltd (THY) is a home-grown construction and interior firm founded in 1974.

With key emphasis in quality and productivity, THY created a sub-division to explore DfMA and developed its modular Dynamic Prefabricated Bathroom Units (D.PBU®). While the D.PBU® has secured both IPA and MAS from local authorities, THY continues to explore means to improve both its products and production processes.

**KEY PRODUCTIVITY INITIATIVES**

- Movement of PBUs to its installation position on site is often a very labour intensive process. THY developed a moving system, comprising customised D.PBU® trolley and heavy duty mover. This moving system not only reduces the manpowered required during the installation process, but also enable precise maneuverers of PBUs on-site.
Tong Hai Yang Pte Ltd
Builder (Prime) Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – ADVOCATES

KEY PRODUCTIVITY INITIATIVES

- To ensure accuracy during fabrication of PBUs, it is important that the PBUs are rested on levelled ground. THY developed a 4-point levelling metal platform using steel plates and integrating adjustable heights screws. These platforms can be reused and its screws can be easily adjusted to facilitate and expedite the levelling process.

- THY also adopted the use of CNC machines for panel cutting. As CNC machines are computerised, the operator only requires to input required cuts and loading of drywall panel. Replacing sawing mechanism with shearing, the CNC machine produces accurate sized panels of uniformly straight cuts. This process also eliminates health and safety hazards such sparks, noise and dust which traditional sawing methods produces.
<table>
<thead>
<tr>
<th>Firm</th>
<th>Category</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Developments Limited</td>
<td>Developer</td>
<td>Platinum</td>
</tr>
<tr>
<td>JTC Corporation</td>
<td>Developer</td>
<td>Gold</td>
</tr>
<tr>
<td>MOH Holdings Pte Ltd</td>
<td>Developer</td>
<td>Gold</td>
</tr>
<tr>
<td>Surbana Jurong Consultants Pte Ltd</td>
<td>Consultant (Architectural)</td>
<td>Gold</td>
</tr>
<tr>
<td>Meinhardt (Singapore) Pte Ltd</td>
<td>Consultant (Structural)</td>
<td>Gold</td>
</tr>
<tr>
<td>Dragages Singapore Pte Ltd</td>
<td>Builder (Open)</td>
<td>Platinum</td>
</tr>
<tr>
<td>Teambuild Engineering &amp; Construction Pte Ltd</td>
<td>Builder (Open)</td>
<td>Platinum</td>
</tr>
<tr>
<td>Kajima Overseas Asia Pte Ltd</td>
<td>Builder (Open)</td>
<td>Gold</td>
</tr>
<tr>
<td>Kimly Construction Pte Ltd</td>
<td>Builder (Open)</td>
<td>Gold</td>
</tr>
<tr>
<td>Straits Construction Singapore Pte Ltd</td>
<td>Builder (Open)</td>
<td>Gold</td>
</tr>
<tr>
<td>Gammon Pte Ltd</td>
<td>Builder (Open)</td>
<td>Merit</td>
</tr>
<tr>
<td>Gammon Construction Ltd Singapore Branch</td>
<td>Builder (Open)</td>
<td>Merit</td>
</tr>
<tr>
<td>DLE M&amp;E Pte Ltd</td>
<td>Builder (Prime)</td>
<td>Merit</td>
</tr>
<tr>
<td>Lightrus Pte Ltd</td>
<td>Builder (Prime)</td>
<td>Merit</td>
</tr>
<tr>
<td>Tong Hai Yang Pte Ltd</td>
<td>Builder (Prime)</td>
<td>Merit</td>
</tr>
</tbody>
</table>
BCA Construction Productivity Award

CPA – Projects

The CPA – Projects is awarded to project teams that have demonstrated productivity in their projects from the design to the end of construction. The award aims to:

- Encourage designers to come up with labour-efficient designs;
- Encourage the adoption of labour-efficient construction methods; and
- Recognise project teams for their excellent project planning and coordination in enhancing productivity.

Assessment Criteria
Building projects are assessed based on their buildable design score, constructability score, simplicity of construction, integration of design and construction, and aesthetics.

The award has nine sub-categories:
- Residential Landed Buildings
- Residential Non-landed Buildings (for projects with Gross Floor Area of less than 25,000m²)
- Residential Non-landed Buildings (for projects with Gross Floor Area of more than or equal to 25,000m²)
- Commercial and Office Buildings
- Institutional Buildings
- Industrial Buildings
- Mixed Development Buildings
- Additions & Alterations / Upgrading Buildings
- Civil Engineering Projects
HAUS@Serangoon Garden
Residential Landed Buildings Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

PLATINUM

KEY FEATURES

• The strut-free open cut method was adopted for basement excavation, saving manpower and time on site.

• Extensive use of precast components such as structural walls, columns, balconies, air-con ledges, bay windows and roof terrace parapet walls were adopted in the project. Other precast elements used included the non-structural service risers and meter chambers. With the use of precast concrete, plastering works were eliminated and a better quality of concrete finishes was achieved.

• Prefabricated Bathroom Units (PBUs) were adopted in the project to improve efficiency and quality control of a space in residential units that traditionally involved many trades. With PBUs, different trades such as waterproofing works, tiling works and fitting works were integrated more efficiently at the PBU factory before delivery and installation on site. This resulted in a cleaner site.

• Use of advanced system formwork for the cast in-situ slabs helped to boost the construction cycle of a typical storey.

• Mobile Elevated Working Platforms (MEWP) in lieu of conventional scaffolding system were used during construction process for carrying out finishes works and M&E installation.

• Internal staircases leading to the upper floors of the units were designed and fabricated in steel. This simplified the assembly and installation process and contributed to less manpower deployed on site.

• Off-form concrete was used for the external perimeter walls which required no skim coat and helped to achieve better finishes in quality. This also improved safety at site as the risk of falling from height was reduced.

Developer
Sparkland Holdings Pte Ltd (City Developments Ltd)

Architectural Consultant
ADDP Architects LLP

Structural Consultant
Tham & Wong LLP

M&E Consultant
United Project Consultants Pte Ltd

Design and Build Contractor
Tiong Seng Contractors Pte Ltd
KEY FEATURES

- Extensive use of precast components such as precast façade, precast column, precast household shelter, precast staircase, precast infill wall cut down construction time and manpower usage as compared to cast in-situ method.

- Column connection areas were provided with skin wall to eliminate the need for any external formwork.

- Easy connection of column to column joint was designed using spiral connector connection system.

- Prefabricated welded mesh was used for this project which reduced the positioning and tying of rebars to improve productivity.

- Most of the architectural features adopted were designed with repeated sizes and dimensions throughout the different blocks for ease of construction and fabrication. The high repetition also helped to maximise the precast mould usage.

- Roof screen wall was converted from cast in-situ to precast concrete for all the residential blocks. This helped to speed up the roof construction process and increase productivity. It also enhanced safety as erecting external cantilever scaffold was not needed.

- Drone was used to take photos for site progress monitoring and safety checks.

- Machineries like scissors lift, boom lift, telescopic handler were widely used to boost work productivity.
Crowne Plaza Hotel Extension
Commercial Buildings Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

PLATINUM

KEY FEATURES

- Prefabricated Prefinished Volumetric Construction (PPVC) was adopted for the project. Off-site production of 252 units of PPVC modules were prefabricated in Shanghai, China. Each module was assembled in a factory setting where the quality is maintained and controlled effectively.

- Using PPVC technology further enhanced site productivity due to its off-site fabrication and finishing works. All trades such as waterproofing, tiling, ceiling, wall laminates, mirrors, wardrobes, shower screens and curtain wall panels were fixed in the PPVC fit-out factory in China.

- With the 100% off-site completion of the finishing works of the modules, PPVC resulted in minimal on-site works for the lobby and mechanical, electrical, plumbing and fire protection connection works to be completed.

- The entire core area was constructed in precast concrete. This helped to achieve good quality finish and verticality thus reducing abortive works. Other intangible benefits included reducing the risk of exposure to work at height thus improving site safety.

- Facade fins and mesh screens were installed by boom lifts and gondolas. This method saved time instead of erecting scaffolding on site.

- Self-compacting concrete was used for the transfer floor due to congested beam reinforcement details. The self-compacting concrete with no vibration procedure required during concrete placement significantly reduced noise to prevent complaints from the guests staying at the existing Crowne Plaza Hotel.

- Use of Building Information Modelling (BIM) technology allowed the project to be explored and reviewed digitally, even before it started. All the M&E services clashes were reviewed and re-adjusted prior to actual site installations.

Developer | OUE Airport Hotel Pte Ltd
Architectural Consultant | WOHA Architects Pte Ltd
Structural Consultant | RSP Architects Planners & Engineers (Pte) Ltd
M&E Consultant | Surbana Jurong Consultants Pte Ltd
Design and Build Contractor | Dragages Singapore Pte Ltd
Oasis Primary School
Institutional Buildings Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

PLATINUM

KEY FEATURES

- Extensive use of precast construction was adopted for the classroom block, multi-purpose hall, indoor sports hall and administration block to reduce labour on site and maximise productivity. The precast components included precast columns, beams and hollow core slabs.

- Metal roofing on steel trusses were used for all blocks. The steel sections were optimised and prefabricated independently for easy site assembly.

- Drywalls which can be erected easily were used as internal walls between classrooms.

- Use of PEX flexible water pipes in lieu of copper pipes make plumbing connection works simpler and more efficient.

- Tiling works directly laid over structural floor omitted the need for screeding, thus saving time.

- Building Information Modelling (BIM) was used to allow better visualisation of building details and detect clashes to avoid abortive works.

---

Developer
Ministry of Education

Architectural Consultant
VivATA Pte Ltd

Structural Consultant
DE Consultants (S) Pte Ltd

M&E Consultant
PTP Engineers Pte Ltd

Builder
Kwan Yong Construction Pte Ltd
Yishun Community Hospital
Institutional Buildings Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

PLATINUM

KEY FEATURES

- Precast Column Structural Steel system or PCSS was adopted for the In-Patient (IP) blocks. The columns were precast and steel beams were fabricated at factory. With this prefabrication method, PCSS not only increased site productivity and efficiency, it also improved quality of construction.

- With Bondek slab designed as permanent slab in PCSS, the Lysaght Bondek sheet was used as temporary support/formwork for casting which had substituted the conventional and tedious scaffolding formwork.

- Standardisation of precast columns was adopted as a further refinement of PCSS. Higher strength of concrete was also used for the columns which further reduced the weight of overall PCSS superstructure works. These value engineering efforts helped to enhance production for speed and ease of construction.

- Conventional spray type vermiculite for fire protection of steel beams was opted out for a new product called Makibe fire-proof blanket. The fire-proof blanket allowed M&E installation and architectural works to be carried out concurrently. The system also eliminated dust particles associated with vermiculite spraying which was beneficial for a healthcare environment.

- Production of the bamboo-textured concrete façade panels, planter boxes and columns was done in one go by using advanced precast technology. The technology not only produced off-form finishes but the installation at site was also simplified with just one hoisting.

- Top-down method was adopted for the 14m deep excavation with 2 basements where the construction of the basements and the superstructure works proceeded simultaneously. This eliminated extensive strutting and ground anchors works and provided better control of ground movement during excavation.

- Building Information Modelling (BIM) was adopted in the project as an essential planning tool to achieve productivity from the conceptualisation stage to the downstream operation stage.

Developer: MOH Holdings Pte Ltd
Architectural Consultant: CIAP Architects Pte Ltd
Structural Consultant: Beca Carter Hollings & Ferner (S.E. Asia) Pte Ltd
M&E Consultant: Parsons Brinckerhoff Pte Ltd
Builder: Kimly–Shimizu Joint Venture
C912 – Design and Construction of Station at Bukit Panjang and Tunnels for Downtown Line Stage 2
Civil Engineering Projects Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

PLATINUM

KEY FEATURES

- The west side of the station, entrance and ventilation structures were in close proximity to existing LRT viaduct and at some locations abutting its foundations. Design of earth retaining structural system was changed from Diaphragm Wall to Secant Bored Piles (SBP) in the form of Donuts and Peanuts for the west entrance and ventilation shafts structures. These helped to limit pier movements to existing LRT viaduct foundation to within permissible limit.

- With the change in design, a strut free excavation for the west entrance and ventilation shafts was made possible resulting in time savings.

- 3 stages of traffic diversions were required for the diversion of 1800mm diameter PUB water pipes and supporting large sized SingTel manholes. To reduce the time for diversion and traffic disruption, a roundabout was designed and implemented which allowed the works to be completed in a single stage.

- A 21m canal located along Woodlands Road and which runs above the tunnels required diversion. Due to the presence of SingTel cables and lack of as-built information, the diversion of the canal was replaced by underpinning the canal with microproples which resulted the removal of this activity from the critical path.

- Adopted Electronic Deck Blasting instead of Normal Electric Blasting to accelerate excavation works in hard rock. For Electronic Deck Blasting, the depth of charge is twice that of Normal Electric Blasting which resulted in faster excavation and increase in productivity.

- System formwork and shoring systems for tunnels and station were adopted. Being light weight, these systems enabled fast and safe assembly on site.

- Spray applied waterproofing membrane system for the station, tunnel external walls and roof slab helped to expedite waterproofing works.

- Utilising BIM as a key enabler, the project team was able to communicate design concepts clearly to all the stakeholders, collaborate seamlessly on design issues through visualisation, conduct clash detection on compact spaces and packed services to reduce abortive works as well as improve productivity of shop drawings generation and documentation.

Developer
Land Transport Authority (LTA)

Architectural Consultant
SAA Architects Pte Ltd

Structural Consultant
BT.Y.LIN International Pte Ltd

Collaborating Structural Consultant
LSW Consulting Engineers Pte Ltd

M&E Consultant
Rankine&Hill (Singapore) Pte Ltd

Design and Build Contractor
Lum Chang Building Contractors Pte Ltd
**BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS**

**Fernvale Lea**
Residential Non-Landed Buildings Category ≥ 25,000 m²

### KEY FEATURES

- Adopted a full precast construction system whereby almost 90% of the elements were precast components. These included columns, façade walls, gable end walls, household shelters, parapet walls, fascia walls, planks and air-con ledges.

- First HDB project to adopt prefabricated bathroom units (PBU) in its construction. This led to savings in manpower on site. In addition, only 2 types of PBUs were used for all the residential units. The standardisation of the PBUs enabled repetition of internal architectural finishes and components thereby shortening the cycle time for both structural and architectural works.

- Adoption of precast column skin eliminated the need for workers to fabricate external formwork at the column / beam interface. This in turn enhanced the safety of the workers working at height.

- Learning curve for the workers which in turn helped to speed up the construction process.

- Standardization of precast installation using spiral connectors and splice sleeves allowed for an easy learning curve for the workers which in turn helped to speed up the construction process.

- Repetitive unit designs and layouts enabled the repeated use of precast moulds which saved time and manpower.

<table>
<thead>
<tr>
<th>Developer</th>
<th>Housing &amp; Development Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Consultant</td>
<td>ADDP Architects LLP</td>
</tr>
<tr>
<td>Structural Consultant</td>
<td>KTP Consultants Pte Ltd</td>
</tr>
<tr>
<td>M&amp;E Consultant</td>
<td>United Project Consultants Pte Ltd</td>
</tr>
<tr>
<td>Builder</td>
<td>Qingjian International (South Pacific) Group Development Co. Pte. Ltd</td>
</tr>
</tbody>
</table>
Sea Esta Condominium
Residential Non-Landed Buildings Category ≥ 25,000 m²

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS
GOLD

KEY FEATURES

- Extensive use of precast lightweight concrete panels and dry partition walls for the non-structural elements helped pave the way for downstream architectural works to be carried out in an efficient and productive manner.

- The repetitive nature of the block layout throughout the residential blocks translated to substructure and floor layouts that were almost identical. This greatly facilitated the ease of construction. Co-ordination work at the site as well as the amount of coordinated services workshop drawings required to be produced was also greatly reduced.

- Aluminium formwork system was adopted to substitute conventional timber and metal formwork for cast in-situ construction. The system implemented enabled the project to achieve improved trade productivity (e.g. less labour required, shortened cycle time etc) and structural quality.

- The project mobilised the use of scissor lift and boom lift to achieve higher productivity for architectural works at the high void areas.

- Spray painting was adopted for all painting works in the project in place of conventional painting method with rolling. This resulted in less manpower and yet was able to provide a better finishing compared to conventional method.

Developer: Hoi Hup Sunway Pasir Ris Pte Ltd
Architectural Consultant: Consortium 168 Architects Pte Ltd
Structural and M&E Consultant: Rankine&Hill (Singapore) Pte Ltd
Design and Build Contractor: Straits Construction Singapore Pte Ltd
Timbre+ at 73A Ayer Rajah Crescent
Commercial Buildings Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

KEY FEATURES

- Adopted steel frame as the building’s main structural system which facilitated ease of construction at site.

- Steel frame was designed along a regular grid for modular column-beam fabrication with bolt and nut assembly. This ensured on-site work was avoided where possible, especially structural welding that requires rigorous testing of the joints.

- Steel columns were fabricated off site with arms and connectors for easy nut and bolt assembly of corresponding steel beams.

- Recycled pre-fabricated shipping containers were used as building facade, walls and food stalls to achieve the design concept and aesthetics.

- Ten pre-fabricated Airstream caravans were imported, then retrofitted off-site as food trucks before delivering to site for positioning. This reduced the amount of site works.

Developer | JTC Corporation
Architectural Consultant | Tan + Tsakonas Architects
Structural Consultant | Harvest Consulting Engineers LLP
M&E Consultant | Unipac Consulting Engineers LLP
Builder | QXY Resources Pte Ltd
ASM Technology Park Building 2
Industrial Buildings Category

BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

GOLD

KEY FEATURES

- Precast elements such as precast columns, beams, hollow core slabs and planks were adopted and delivered to site for Just-In-Time (JIT) installation.

- Design of a consistent floor to floor height from 2nd to roof storey helped to save time as additional design of formwork and coordination works were omitted due to the standardisation.

- Nuform wall formwork system was used for core walls and helped to achieve productivity improvement as compared to traditional timber formwork.

- Curtain wall for the external façade reduced the amount of site work and allowed for greater control over component quality with less workmanship issues.

- Installation of curtain wall was carried out using boom lifts and gondolas without the need for scaffolding.

- Adopted Greencast EcoWall as a non-load bearing internal and external partition wall which can be customised up to 6000mm for vertical and horizontal placement.

- Use of mechanical joints for M&E piping systems eliminated the need for skilled labour for hot works (welding).

- Adopted Building Information Modelling (BIM) to check for clashes between M&E services, structural provision and architectural components. BIM was also used to produce M&E coordination drawings, architectural shop drawings, and concrete body plan for construction purposes.

Developer
ASM Technology Singapore Pte Ltd

Architectural Consultant
Mode Architects Pte Ltd

Structural Consultant
OCC Consultants Pte Ltd

Collaborating Architectural Consultant
S T Yeo & Associates

M&E Consultant
Surbana Jurong Consultants Pte Ltd

Builder
Kimly Construction Pte Ltd
## Jubilee Bridge
Civil Engineering Category

### BCA CONSTRUCTION PRODUCTIVITY AWARD – PROJECTS

#### GOLD

![Jubilee Bridge Image](image)

**Developer**
Urban Redevelopment Authority

**Architectural Consultant**
Architects 61 Pte Ltd

**Structural and M&E Consultant**
Arup Singapore Pte Ltd

**Builder**
Marina Technology and Construction Pte Ltd

#### Key Features

- Precast segmental balance cantilever construction approach was adopted to minimise construction in water and on-site. Precast segments were added progressively on alternating sides of a central pillar, with precast half shell being used as a permanent formwork for the pier diaphragm where concrete was cast in-situ inside the shells.

- Segments were casted in an off-site yard, eliminating the use of temporary staging works. This translated to cost, time and resource efficiency and also minimised obstruction to maritime, road and pedestrian traffic.

- Bare high quality concrete surface with only mere painting eliminated the need for extra cladding. At the same time, railing balustrade with tension cable helped to ensure fast installation.

- O-Cell pile test methodology was used and this removed the need to transport large amount of concrete blocks.
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Category</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAUS@SerangoonGarden</td>
<td>Residential Landed Buildings</td>
<td>Platinum</td>
</tr>
<tr>
<td>Rivervale Delta</td>
<td>Residential Non-Landed Buildings ≥ 25,000m²</td>
<td>Platinum</td>
</tr>
<tr>
<td>Crowne Plaza Hotel Extension</td>
<td>Commercial Buildings</td>
<td>Platinum</td>
</tr>
<tr>
<td>Oasis Primary School</td>
<td>Institutional Buildings</td>
<td>Platinum</td>
</tr>
<tr>
<td>Yishun Community Hospital</td>
<td>Institutional Buildings</td>
<td>Platinum</td>
</tr>
<tr>
<td>C912 – Design and Construction of Station at Bukit Panjang and Tunnels for</td>
<td>Civil Engineering Projects</td>
<td>Platinum</td>
</tr>
<tr>
<td>Downtown Line Stage 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fernvale Lea</td>
<td>Residential Non-Landed Buildings ≥ 25,000m²</td>
<td>Gold</td>
</tr>
<tr>
<td>Sea Esta Condominium</td>
<td>Residential Non-Landed Buildings ≥ 25,000m²</td>
<td>Gold</td>
</tr>
<tr>
<td>Timbre+ at 73A Ayer Rajah Crescent</td>
<td>Commercial Buildings</td>
<td>Gold</td>
</tr>
<tr>
<td>ASM Technology Park Building 2</td>
<td>Industrial Buildings</td>
<td>Gold</td>
</tr>
<tr>
<td>Jubilee Bridge</td>
<td>Civil Engineering Projects</td>
<td>Gold</td>
</tr>
</tbody>
</table>