

ANNEX A

CPA – Advocates

The Construction Productivity Award (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 which is a combination of the previous CPA – Best Practices and Innovations and the CPA – Value Added Productivity (VAP), now gives more focus and better recognises the contributions of various stakeholders.

CPA – Advocates has four sub-categories:

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

Assessment Criteria included:

1. Buildable design score
2. Constructability score
3. Productivity performance (physical and value-added productivity)
4. Productivity initiatives

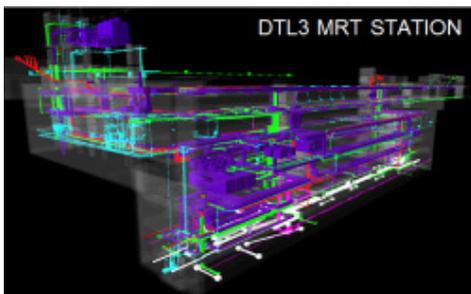
Consultant Category (Civil & Structural)



Arup Singapore was a consultant for the iconic Marina Bay Sands project



Steel Fibre Reinforced Concrete (SFRC) bored tunnel precast segmental lining was adopted for the Land Transport Authority Downtown Line Stage 3 project.



Arup Singapore used Building Information Modelling (BIM) on notable projects such as the Downtown Line 3 MRT stations.

Arup Singapore Pte Ltd (Gold)

Established in Singapore since 1968, Arup is a global design, engineering and business consultancy with more than 11,000 staff spanning 90 offices in 38 countries around the globe. Arup pursues quality and excellence which is reflected in its impressive portfolio of iconic and award-winning developments including Marina Bay Sands, The Helix, Singapore Flyer, Sydney Opera House, and the Beijing National Stadium.

In Singapore, Arup's success is founded on delivering their global expertise locally and they now have over 300 staff offering a range of specialist disciplines unparalleled in this market.

Key Productivity Initiatives:

- The adoption of Steel Fibre Reinforced Concrete (SFRC) bored tunnel precast segmental lining for the Land Transport Authority Downtown Line Stage 3 was a first in South East Asia. By using SFRC, construction productivity was improved by about 25% as compared to traditional steel bar reinforced concrete precast segmental lining. This method also reduced the required factory space, facilitated rapid automated segment carousel production, and delivered more durable and cost-saving tunnels.
- Arup extensively used Building Information Modelling (BIM) on notable projects such as Downtown Line 3 MRT stations, the upcoming Singapore Sports Hub and Marina Bay Sands Integrated Resort. BIM allowed the management of large amounts of data and combined the structural, Mechanical and Electrical (M&E) and system services, and architectural finishes in a coordinated manner. The collaborative environment made possible the integration of design, clash detection, virtual interactive resolution, parametric design that maximise the standardisation of large numbers of truss connections and facade panels, generating unfolded models of fabrication drawings. This initiative has improved productivity across multiple disciplines and companies working together on substantial and complex projects in the design and construction phases.

Consultant Category (Quantity Surveying)



Langdon & Seah has actively advocated the adoption of Early Contractor Involvement (ECI).



The firm regularly engages and conducts research on the various aspects of Building Information Modelling (BIM).

Langdon & Seah Singapore Pte Ltd (Gold)

Langdon & Seah Singapore Pte Ltd has vast experience in providing cost, contract and project management services for construction projects.

Key Productivity Initiatives:

- Langdon & Seah has advocated the adoption of Early Contractor Involvement (ECI) where contractors are involved in the early stages of design to contribute their expertise towards areas such as construction scheduling and planning. This extensively reduces potential risks whilst harnessing the latest knowledge and technologies from contractors. ECI has been adopted in several prestigious projects such as South Beach, the Bedok Integrated Project and Changi Airport Terminal 4.
- Langdon & Seah continues to engage and conduct research on the various aspects of Building Information Modelling (BIM).

Builder – Open Category



Antara Koh Private Limited specialises in civil engineering and marine structure construction.

Antara Koh Private Limited (Gold)

Antara Koh Private Limited is a specialist contractor in civil engineering and marine structure construction. Established in 1974, Antara Koh relentlessly kept up and developed their technology and resources to handle larger and technically demanding projects in the field of foundation, civil engineering and marine projects.

Key Productivity Initiatives:

- Antara Koh has advocated the use of Real Time Kinematic (RTK) Global Positioning System (GPS) for their marine pile positioning. Equipped with this technology, such system allowed piling to be conducted at night and in all weather conditions. Traditionally, marine piles positioning were carried out by three shore-based surveyors equipped with theodolite using triangulation method. By adopting this technology, it has



The firm advocated the use of Real Time Kinematic (RTK) Global Positioning System (GPS) for their marine pile positioning.

improved the productivity of pile installation by two times.

- Antara Koh is equipped with the expertise in drilling land or marine bored piles with the combination of Down The Hole (DTH) Hammer drilling tool and Reverse Circulation Drill (RCD) machine which results in higher productivity when drilling in rocks.



Hua Siah has adopted productive technologies such as mast climbing platforms to replace traditional scaffolding.



The firm ensures that all their sub-contractors use productive technologies such as the boom lift.

Hua Siah Construction Pte Ltd (Gold)

Hua Siah Construction Pte Ltd's core expertise is in the construction of industrial developments. To date, Hua Siah had completed more than 100 industrial buildings in Singapore.

Key Productivity Initiatives:

- With the co-funding from the Mechanisation Credit (MechC) Scheme, Hua Siah has adopted productive technologies such as mast climbing platforms to replace traditional scaffolding. As a result, workers do not have to erect scaffolding at every floor, saving time as well as enhancing workplace safety.
- As a main contractor, Hua Siah strives to ensure all their sub-contractors embark on their productivity journeys through mechanisation of site processes e.g. through deployment of productive technologies such as the boom lift and scissor lift.



Samwoh adopted a productive crack measurement system which uses laser and image recognition technology to collect road condition data for road maintenance.



Using the water blasting method, the firm is able to remove pavement markings without the need to grind and damage the road surface.

Samwoh Corporation Pte Ltd (Gold)

Samwoh Corporation is a leading integrated civil and infrastructure construction company with a strong focus on research and technological innovation. To date, Samwoh has introduced more than 20 productivity-related initiatives with more than half awarded government grants.

Key Productivity Initiatives:

- Samwoh advocates productivity by actively participating in seminars to share its technologies. The Samwoh R&D Center is open to both public and private visitors where a behind-the-scenes tour of the research center and new innovative technologies used by Samwoh to improve productivity are shared.
- Samwoh's productivity mission is to re-design, re-engineer and re-invent new technology and know-how. This saw the company introducing many new initiatives to improve construction productivity, with the support of the BCA Construction Productivity and Capability Fund (CPCF). Many of these productivity initiatives that are the first to be implemented in Singapore involved in-depth technical study and innovation. These include the multi-laser scanning technology for road and airport pavement and ultra high pressure water-blasting method for lane marking removal.



Straits Construction has adopted the Site Access System (SAS) which utilised biometric identification, a contactless facial scanner to regulate faster entry and exit at the site.

Straits Construction Singapore Pte Ltd (Gold)

To achieve higher construction productivity, Straits Construction has tapped on BCA's Construction Productivity and Capability Fund (CPCF) as well as other government schemes to mechanise its work processes. In its recent completed projects, the constructability score were above the minimum legislated score of 50.

Key Productivity Initiatives:

- Straits Construction has adopted the Site Access System (SAS) which utilised biometric identification, a contactless facial scanner to regulate faster entry and exit at site. This system also helps to generate various manpower and productivity reports. Prior to this system, the calculation of staff and workers mandays had to be done



Building Information Modelling (BIM) enhanced buildability and cost-efficiency. It also allows early planning and detection of clashes which improves site coordination works.

manually which is a time consuming and tedious process.

- Since 2011, Straits Construction has embarked on the use of Building Information Modelling (BIM). This enhances buildability and cost-efficiency. BIM also allows early planning and detection of clashes which improves site coordination works.



Tiong Seng used system formwork in their projects extensively.

Tiong Seng Contractors Pte Ltd (Gold)

Over the years, Tiong Seng has evolved from a local builder that handles infrastructure and school projects into one that possesses established track records in notable projects such as the Sentosa Integrated Resorts, Marina Bay Financial Centre, Capella Hotel, St. Regis Hotel & Residences, Park Royal Hotel and private residential projects such as Parc Emily, Sky @ Eleven and Shelford Suites .

Key Productivity Initiatives:

- To push construction productivity to a greater height, Tiong Seng developed the first Prefab Hub in Singapore. The Prefab Hub stands out as being truly multi-purpose. The facility not only houses the automated precast plant, it has space for building prefabricated bathroom units and for pre-assembling, storing and maintaining advanced formwork systems. It also has a training centre, a Building Information Modelling (BIM) Centre and a workers' dormitory. The co-existence of all these related activities and facilities under one roof makes it easier for managing resources, while improving land productivity.
- Tiong Seng actively shares their experience and knowledge with the industry through seminars and conferences like the BCA Build Smart conference.



The firm developed the first Prefab Hub in Singapore.

	<ul style="list-style-type: none"> Compared to the conventional way of using bricks for the building envelop, Tiong Seng adopted a full precast envelope system, which used full precast components for the external walls. This eliminated the need for scaffolding which is time consuming and labour intensive. A full precast envelop system also helps address issues such as site space constraints when having to stock up materials required for conventional wet work and keeping the site tidy and clean. As the precast facade is done in a factory controlled environment, the finish quality is consistent.
 <p>Koh Brothers advocated the use of precast construction in their projects.</p>  <p>The firm continues to place great emphasis on staff training.</p>	<p>Koh Brothers Building & Civil Engineering Contractor (Pte) Ltd (Merit)</p> <p>Koh Brothers has advocated the use of precast concrete, drywall, system formwork and Building Information Modelling (BIM) in their construction projects to improve productivity.</p> <p>Key Productivity Initiatives:</p> <ul style="list-style-type: none"> To build up Koh Brothers' capability in precast, a precast plant was set up in Oct 2013 at Johor Bahru to support Singapore's production capacity of ready mixed concrete and precast components. Koh Brothers places great emphasis on staff training by getting their staff to attend productivity-related courses. The company also recognises workforce development as an important value chain to improve productivity. It has also established a \$1 million Productivity Improvement Scheme (PIS) fund for five years beginning 2013 for its company's productivity initiatives, to be aligned with the government's effort to improve productivity in the construction sector.
Builder – Prime Category	
	<p>Sterling Engineering Pte Ltd (Gold)</p> <p>Since 1994, Sterling Engineering has been providing structural steel engineering and pre-fabrication solutions to Singapore's construction sector. Sterling Engineering is committed to reduce its labour by 25% within 3 years from 2011 through the use of technology adoption</p>



Sterling Engineering specialises in structural steel fabrication and installation.



The automatic hydraulic shearing machine it purchased with funding support from the BCA Construction Productivity and Capability Fund produces better quality work and also reduced manpower required.

and workforce development.

Key Productivity Initiatives:

- Sterling Engineering utilised the Mechanisation Credit scheme under BCA's Construction Productivity and Capability Fund to purchase productive equipment such as the automatic hydraulic shearing machine, CNC plasma cutting machine, gantry crane and the automatic pipe profile cutter. With such technologies, it was able to produce better quality work and also reduce manpower required.
- Sterling Engineering has also advocated the need for skills upgrading to form an experienced, skilled pool of workforce. This was achieved by tapping on the Workforce Training and Upgrading (WTU) scheme under BCA's Construction Productivity and Capability Fund (CPCF), which helped the firm to defray the costs of training and upgrading its workers.