



# BCA AWARDS 2019

Recognising Excellence in the Built Environment

An Initiative Under

**BuildSG**

**BCA**  
**20** years of  
building SG  
together



# BCA DESIGN AND ENGINEERING SAFETY AWARD

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The BCA Design and Engineering Safety Award 2019 gives recognition to the Qualified Person for Structural Works [QP(ST)], QP(ST)'s firm and the project team for ingenious design processes and solutions in overcoming project challenges to ensure safety in design, construction and maintenance of building and civil engineering projects locally and overseas.

The Award aims to:-

- a) Inculcate a strong safety culture among building professionals in developing our built environment
- b) Give recognition to QP(ST)s and their firms for engineering achievements
- c) Provide an avenue through which competition for work excellence can be enhanced.

The Awards will be given out for the following categories:

- Residential
  - Commercial
  - Institutional and Industrial
  - Civil Engineering
  - Small Scale Projects (Project cost < \$30 million)
  - Overseas
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# FRASERS TOWER

Commercial Category



## BCA DESIGN AND ENGINEERING SAFETY AWARD | EXCELLENCE



### Qualified Person

Engineer Kam Mun Wai

### C&S Consultant

Meinhardt (Singapore) Pte Ltd

### Builder

Hyundai Engineering & Construction Co. Ltd

### Developer

Frasers Property Singapore

### Architectural Consultant

DP Architects Pte Ltd

### KEY CHALLENGES

- Iconic and slender high-rise tower with sloping facade
- Deep basement construction in highly variable Jurong Formation and construction of underground pedestrian walkway linking to Tanjong Pagar MRT Station Underpass
- Close proximity to Telok Ayer Chinese Methodist Church (National Monument of Singapore), the Clift and Bangkok Bank Building

### SOLUTIONS

- Adoption of a robust, practical and yet cost-efficient Earth Retaining/Stabilising Structures (ERSS) comprising secant pile wall and semi-top down construction method to minimise wall deflection, ground movement and water drawdown. This had resulted in the safe execution of the 3-level basement construction, without adversely affecting the integrity of adjacent sensitive properties and structures.
- Sustainable raft foundation system with settlement-reducing piles for the high-rise tower and tension piles for the podium. The favourable ground stratum below the basement was strategically considered to provide support to the building structure. Piles were introduced to reduce stress concentration and control settlements.
- Flat plate system for basement and podium to facilitate semi-top down construction and enhance buildability and productivity; highly buildable, repetitive and standardised post-tensioned band beam system for the typical office floors enabling the adoption of light-weight table forms for faster construction
- Innovative, well-defined structural load paths and key structural elements design and detailing, taking into due consideration the gravity loads, high wind loads and additional horizontal forces as a result of the sloping columns and slenderness of the high-rise tower.

# NATIONAL CENTRE FOR INFECTIOUS DISEASES AND CENTRE FOR HEALTHCARE INNOVATION

Institutional & Industrial Category



## BCA DESIGN AND ENGINEERING SAFETY AWARD | EXCELLENCE



### Qualified Person

Engineer Kam Mun Wai

### C&S Consultant

Meinhardt (Singapore) Pte Ltd

### Builder

Kajima Overseas Asia (Singapore) Pte. Ltd.

### Developer

Ministry of Health

### Architectural Consultant

CPG Consultants Pte Ltd

### KEY CHALLENGES

- Deep basement construction (up to 24m) in highly variable Jurong Formation
- Unbalanced excavation due to undulating ground terrain 1.5m across site
- Construction of 3 numbers of deep underpasses below Jalan Tan Tock Seng
- Erection of 3 bridges to provide inter-building connectivity to Tan Tock Seng Hospital and Lee Kong Chian (LKC) School of Medicine
- Close proximity to existing hospitals, LKC conservation building and surrounding residential developments

### SOLUTIONS

- Innovative and robust Earth Retaining/Stabilising Structures (ERSS) comprising contiguous bored pile wall and full top down construction method to minimise wall deflection, ground movement and water drawdown. This had resulted in the safe execution of the 4-level basement construction, without adversely affecting the integrity of adjacent sensitive properties and structures.
- Adoption of full top down method to enable excavation and superstructure construction concurrently due to the fast track programme
- Hybrid piled raft foundation system maximising the favourable ground condition resulting in time and cost savings to the foundation; flat slab system for basements to facilitate full top down construction and enhance buildability and productivity
- Highly buildable, repetitive and standardised semi-precast system with band beams and hollow core slabs for the superstructure, designed for future proofing
- Light weight composite steel trusses with segmental and sequential erection enabling safe construction of the bridges over the busy Jalan Tock Seng Seng road.



# THE ARC

Institutional & Industrial Category



## BCA DESIGN AND ENGINEERING SAFETY AWARD | EXCELLENCE



### Qualified Person

Engineer Aaron Foong Kit Kuen

### C&S Consultant

KTP Consultants Pte Ltd

### Builder

Lian Ho Lee Construction (Private) Limited

### Developer

Nanyang Technological University

### Architectural Consultant

DCA Architects Pte Ltd / KIRK

### KEY CHALLENGES

- Curvilinear building geometry within a 1.6m height sloping site surrounded by existing buildings on all sides
- Presence of multiple critical live underground services corridor overlapping directly with the building footprint

### SOLUTIONS

- Innovative Building Information Modelling (BIM) with Virtual Design and Construction (VDC) technology seamlessly implemented from design to construction achieving a safe and buildable structure-foundation outcome
- Elimination of intrusive services diversion by creatively engineering the co-location of building structures and services corridor by way of self-stabilising micropile groups foundation
- Design of a strut-free excavation system with contiguous bored pile wall and removable ground anchor system to achieve safe and productive construction works within the high unbalanced slope

# MY FIRST SKOOL LARGE CHILDCARE CENTRE AT PUNGGOL DR

Small Scale Projects Category



## BCA DESIGN AND ENGINEERING SAFETY AWARD | EXCELLENCE



### Qualified Person

Engineer Lauw Su Wee

### C&S Consultant

LSW Consulting Engineers Pte. Ltd

### Builder

Kwan Yong Construction Pte Ltd

### Developer

NTUC First Campus Co-operative Limited

### Architectural Consultant

LAUD Architects Pte Ltd

### KEY CHALLENGES

- It is a fast track project aiming to deliver the building in one year for the operation of the new childcare centre in time;
- The building is of irregular shape, like two "seashell" pivoting around the centre point;
- The building also featuring a 12m height, curved glass façade supported by steel framing, at the back of each "seashell";
- The client would like to have a more open space and lesser columns for flexibility and re-partitioning of the rooms in the near future.

### SOLUTIONS

- Full precast floor system with precast pretensioned rib beams and powerdek as left in formwork, such that the basic structure of the 2-story building with roof terrace was completed within 3 months;
- Long span (up to 18m) post-tensioned curve main beams were adopted, so as to give more column free space within the building;
- DfMA solution for the 12m height curve façade, with standardized and repetitive vertical and horizontal trusses, fabricated in the factory and assembled on site.

# ASSISI HOSPICE

Institutional & Industrial Category



## BCA DESIGN AND ENGINEERING SAFETY AWARD | MERIT



### Qualified Person

Engineer Tan Wai Hiong

### C&S Consultant

Meinhardt (Singapore) Pte Ltd

### Builder

Soilbuild Construction Group Ltd

### Developer

Assisi Hospice

### Architectural Consultant

New Space Architects Pte Ltd

### KEY CHALLENGES

- Constraints site with existing MRT Circle Line tunnels, Marymount Flyover, MacRitchie Viaduct, Thomson Road, Future MRT Thomson Line, Future North-South Expressway tunnels.
- Unbalanced excavation due to undulating ground terrain with 10 m difference next to existing Assisi Hospice.
- Long span link bridge connecting north and south of building, at 4<sup>th</sup> storey.

### SOLUTIONS

- Robust Earth Retaining Stabilising System (ERSS) comprising of sheetpiles with partial excavation on 2 sides and secant bored piles on 2 sides, struted to central basement structure / island. Analysis carried out incorporated movement limits by LTA. Detailed 2D and 3D finite element modelling was carried out systematically to analyse and design the SBP system.
- The robust ERSS minimises the impact of ground movement to neighbouring properties, including sensitive structures such as MRT Circle line tunnels, fly over viaduct structure and existing Mount Alvernia hospitals and Assisi Hospice structures. The use of SBP instead of conventional cut and cover method mitigate the impact of ground movements, vibrations, existing structure movements etc.
- Repetitive flat plate structural system designed for typical ward levels, minimising floor-to-floor height, construction time, and enhancing site productivity and construction safety.
- Extensive coordination on routing of M&E services with ceiling spaces and provision of penetration through slabs and beams using BIM, and extensive collaboration of Consultants, Builder and Client to throughout design and construction stages to meet Client's requirements.
- Composite steel floor system for the link bridge to enhance buildability, productivity and safety in construction.

# CONTRACT 1688 - CONSTRUCTION OF STATION EW30 AND VIADUCT FOR TUAS WEST EXTENSION

## Civil Engineering Category



### BCA DESIGN AND ENGINEERING SAFETY AWARD | MERIT



#### Qualified Person

Engineer Rengasamy Selvaraju

#### C&S Consultant

AECOM Singapore Pte Ltd

#### Builder

Shanghai Tunnel Engineering Co (Singapore) Pte Ltd

#### Developer

Land Transport Authority

#### Architectural Consultant

AEDAS Pte Ltd

#### KEY CHALLENGES

- 4 level Interchange Station above live 6-lane roadway (2 carriageways).
- Continuous long, 5 spans (53m-75m-75m-75-53m) with curved alignment at the crossing of Pan-Island Expressway along Tuas Road, where the rail viaduct to be constructed over live traffic.
- Construction of the rail viaduct that crosses over an existing road viaduct at Ayer Rajah Expressway at a height of 21 m over busy live traffic
- Limestone cavity encountered during construction of piling.

#### SOLUTIONS

- Main RC frames cast-in-situ every 25m to piled foundations and PSPC girders as main floor elements between frames. Use of PC planks / metal decking between PSPC beams. The roof is a steel diagrid modular truss system erected on site. Many stages of traffic diversions carried out to construct foundations and use of lifting equipment where necessary.
- Using the balance cantilever method over the live Pan-Island Expressway with the segmental post tensioned precast beams across. This method adjusts for changes in pier distances and suitable for curved spans. Also, the system minimises construction and footprint over live traffic and the work can be staged to suit ongoing traffic conditions.
- The span-by-span technique is employed to construct the rail viaduct over an existing road viaduct at Ayer Rajah Expressway. The beams were launched at 21 m above ground at 36m long span and maintaining a safe working environment at height with no impact on the Ayer Rajah Expressway.
- Additional probing has been carried out at every pile proposed at the cavity prone location to ensure the cavity depth from ground level and the pile design was revised accordingly. Permeant casing are provided from ground level and terminate below 500mm from the bottom of cavity.



# BCA DESIGN AND ENGINEERING SAFETY AWARD | EXCELLENCE

## PROJECT NAME

Frasers Tower

National Centre for Infectious Diseases and Centre for Healthcare Innovation

The Arc

My First Skool Large Childcare Centre At Punggol Dr

## CATEGORY

Commercial

Institutional & Industrial

Institutional & Industrial

Small Scale Projects

## QP / QP COMPANY

Engineer Kam Mun Wai  
Meinhardt (Singapore) Pte Ltd

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Meinhardt (Singapore) Pte Ltd

Engineer Aaron Foong Kit Kuen  
KTP Consultants Pte Ltd

Engineer Lauw Su Wee  
LSW Consulting Engineers Pte Ltd



## BCA DESIGN AND ENGINEERING SAFETY AWARD | MERIT

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### PROJECT NAME

Assisi Hospice

Contract 1688- Construction Of Station Ew30 And Viaduct For Tuas West Extension

### CATEGORY

Institutional & Industrial

Civil Engineering

### QP / QP COMPANY

Engineer Tan Wai Hiong  
Meinhardt (Singapore) Pte Ltd

Engineer Rengasamy Selvaraju  
AECOM Singapore Pte Ltd