



BCA AWARDS 2018

Recognising Excellence in the Built Environment





BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD



The BCA Design and Engineering Safety Excellence Award 2018 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

THE VENUE RESIDENCES & SHOPPES

Residential Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | MERIT



Qualified Person Engineer Dr. Shahzad Nasim

C&S Consultant Meinhardt (Singapore) Pte Ltd

Builder Dragages (S) Pte Ltd

Developer Crescent View Developments Pte Ltd
(JV between City Developments Limited
and Hong Leong Holdings Limited)

**Architectural
Consultant** Aedas Pte Ltd

KEY CHALLENGES

- Very congested site next to heavy-traffic along Upper Serangoon Road, Macpherson Road and PIE, and in close proximity to existing shop houses which are very sensitive to movements, next to MRT tunnels, DTSS tunnels etc.
- The site is inherent with poor ground conditions where soft marine clay were found
- Building foundation and basement structures had to be designed to safeguard adjacent existing sensitive shop houses, Deep Tunnel Sewerage System tunnels, MRT tunnels, Road Tunnels, Expressway bridge etc..

SOLUTIONS

- Innovative development and use of peanut shaped self-supporting strut free diaphragm wall retention system for 3 level basement excavation and construction
- Extensive use of precast beam, slab, wall systems and integrating facade Reckli finishes with precast reinforced concrete wall.

WATERTOWN & WATERWAY POINT

Residential Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | MERIT



Qualified Person	Engineer Kam Mun Wai
C&S Consultant	Meinhardt (Singapore) Pte Ltd
Builder	Hyundai Engineering & Construction Co Ltd
Developer	Emerald Star Pte Ltd and FC Retail Trustee Pte Ltd
Architectural Consultant	RSP Architects Planners & Engineers (Pte) Ltd

KEY CHALLENGES

- Deep basement excavation of more than 20m in poor ground conditions
- Undulating ground terrain resulting in unbalanced excavation on 3 sides of the development. The level difference is in excess of 15m
- Integration with an existing cantilevered diaphragm wall that was constructed to facilitate the excavation for the waterway

SOLUTIONS

- The Earth Retaining/Stabilising System (ERSS) adopted for the unbalanced excavation comprised a hybrid of diaphragm wall and secant pile wall. Diaphragm walls formed an effective resistance and transfer of the unbalanced lateral loads to the ground. The diaphragm walls not only act as a retaining wall, it also provide shear walls to resist and transfer the lateral loads to the ground.
- Cross diaphragm walls were introduced along strategic locations in the basement to transfer the lateral loads due to lack of passive resistance from the waterway. They were also designed as load bearing foundation elements to support the retail and residential structure above.
- Localised ground improvement was carried out where Kallang Formation was encountered to improve the soil shear strength and stiffness to better control ground movements.

TANJONG PAGAR CENTRE

Commercial Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | AWARD



Qualified Person	Engineer Chia Wah Kam / Engineer Jason Tan Bok Leng
C&S Consultant	Arup Singapore Pte Ltd
Builder	Samsung C&T Corporation
Developer	Guocoland Group
Architectural Consultant	Skidmore, Owings & Merrill LLP / Architects 61 Pte Ltd

KEY CHALLENGES

- The development sits on a congested site bounded by a few roads, the busy Tanjong Pagar MRT station and a number of other historic shophouses
- The tall, slender and inclined building geometry exerts opposing forces at different levels, posing unique engineering challenges

SOLUTIONS

- A top-down construction approach was adopted to allow the optimisation of basement construction which translated to time and cost savings.
- To work around the challenge of space constraints, steel was adopted for the office podium and basement structures. Speed and constructability were achieved.
- Pre-setting was done to take into account the building's movement, overcoming the inclined building geometry.
- At the upper levels where the building transits from office to residential space, an innovative transfer and belt-truss system was designed to achieve stability of the overall tower structure.

THE WAVE

Institutional & Industrial Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | AWARD



Qualified Person	Engineer Teh Hee Seang
C&S Consultant	T.Y.LIN International Pte. Ltd.
Builder	B19 Technologies Pte Ltd
Developer	Nanyang Technological University
Architectural Consultant	Sembcorp Architects & Engineers Pte Ltd / Toyo Ito & Associates, Architect

KEY CHALLENGES

- Singapore's first large-scale Mass Engineered Timber Building
- Huge timber arched roof that spans 72 m is amongst the longest span of its kind in the world
- Familiarity with design codes for engineered timber products

SOLUTIONS

- Choice of 3-pin arched roof beams enable construction without scaffolding and in short period. This result in a safe and fast construction method.
- Simplicity for construction due to high level of prefabrication and minimum waste as the timbers are precision cut at factory and delivered to site.
- Systematic and coordinated approach to research and understand the fundamental technical characteristic and behaviour of timber, consultations with the regulating agencies and technical committee to achieve safe and acceptable design solutions.

CHANGI AIRPORT TERMINAL 4

Institutional & Industrial Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | AWARD



Qualified Person

Engineer Lai Huen Poh

C&S Consultant

RSP Architects Planners & Engineers (Pte) Ltd

Builder

Takenaka Corporation

Developer

Changi Airport Group (Singapore) Pte Ltd

Architectural Consultant

SAA Architects Pte Ltd

KEY CHALLENGES

- Construction of 5 buildings including Terminal Building and airport facilities with Construction Floor Area of 376,000 m² within tight time frame and requirement of early handover of Baggage Handling installation
- 60m and 45m large span roof structures with 18.5m cantilever roof to achieve spatial and column free environment..
- Installation of Finger Pier and 21 numbers of Fixed Gangway structures located within Airside with live aircraft parking stands and compliance with strict requirements of security clearance and airside operational needs.

SOLUTIONS

- Adopting Building Information Modelling (BIM) and prefabricated volumetric design and construction
- Full Precast System Approach with use of Advanced Precast Mechanical beam shoe Connectors. Precast beams and planks designed for both temporary and permanent stage loads to eliminate the necessity of 9m high scaffoldings and props.
- The use of repetitive simple plane frame steel roof trusses with secondary beam system simplify detailing and allows for off-site prefabrication to speed up erection and work proceed simultaneously. Innovative addition of “knee brace” between trusses at roof level provides the lateral restraint for continuous truss bottom chord in compression at supports.
- Developed innovative and game-changing advanced L2 floor and “Hat First” construction methodology

NATIONAL GALLERY SINGAPORE

Institutional & Industrial Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | MERIT



Qualified Person

Engineer Leong Meng Sun

C&S Consultant

CPG Consultants Pte Ltd

Builder

Takenaka-Singapore Piling Joint Venture

Developer

National Gallery Singapore

Architectural Consultant

CPG Consultants Pte Ltd / Studio Milou, Singapore

KEY CHALLENGES

- Retain and protect existing decorative façade walls (24m high free-standing walls after demolition).
- Excavate and construct the 16m deep basement structures, within the building perimeter and in very close proximity to the preserved facade.
- Suspend entire existing structures (City Hall Chamber) at the 3rd storey with its columns removed below; while excavating and constructing the basement beneath these preserved structures.

SOLUTIONS

- Underpin conserved structures with a network of needle beams, underpinning beams and micropile foundation.
- Install a stabilising shoring system to hold up the 24m tall free-standing facade walls after demolition works. Top-down construction utilised together with a stiff diaphragm wall to minimise movement of the basement retaining walls and the preserved facade walls.
- Very detailed construction sequence set up between the structural engineer and contractor to ensure that the robustness and stability of the preserved and conserved structures.
- Transfer structures installed to support the elevated and preserved City Hall Chamber with jacks and pre-loading applied to ensure proper load transfer.

SENGKANG GENERAL HOSPITAL

Institutional & Industrial Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | MERIT



Qualified Person

Engineer Kam Mun Wai

C&S Consultant

Meinhardt (Singapore) Pte Ltd

Builder

Penta-Ocean Construction Co., Ltd

Developer

Ministry of Health

Architectural Consultant

DP Architects Pte Ltd

KEY CHALLENGES

- Deep excavation of 12m in poor ground condition
- Congested surrounding, access constraints and close proximity to Cheng Lim LRT station & viaducts, public housing and schools, widening of existing roads along Sengkang East Road, Sengkang East Way & Anchorvale Street
- Low floor-to-floor height due to AMSL limit

SOLUTIONS

- Innovative hybrid retaining wall system of diaphragm wall and secant pile wall to overcome difficult ground conditions, better control of ground movements and yet offer an overall cost-effective design
- With careful planning, integration of temporary construction access and storage into ERSS design that enabled smooth uninterrupted access, excavation and earth disposal.
- Flat slab system provides high flexibility for routing of M&E services and maximises headroom in an otherwise very low floor-to-floor height
- Innovative beam stitching technique for the LRT link bridges enabling uninterrupted access for commuters using the LRT
- Extensive use of prefabrication where possible

DTL 3 C937 FORT CANNING STATION & ASSOCIATED TUNNELS

Civil Engineering Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | AWARD



Qualified Person	Engineer Tan Yoong Heng/ Engineer Cheryl Lee Zi Du
C&S Consultant	Arup Singapore Pte Ltd
Builder	GS Engineering & Construction Corporation
Developer	Land Transport Authority
Architectural Consultant	Aedas Pte Ltd

KEY CHALLENGES

- Contract 937 – Fort Canning station and associated tunnels was constructed within a very dense and congested urban network, and avoiding impact to it was critical to the project's success.
- The key challenges included the temporary diversion of the Singapore River, tunnel construction overcrossing/undercrossing of existing MRT lines at minimal clearances; and tunnelling in very close proximity to numerous existing underground structures.

SOLUTIONS

- An innovative, first-of-its kind temporary diversion of the Singapore River was designed to facilitate removal of all underground obstructions well in advance so as to reduce construction risk during tunnelling works.
- As opposed to creating standalone structures for cripple sidings on a separate land parcel, Arup developed an innovative and cost-effective solution by locating them within the station box. This overcomes space constraints in a congested area, and avoided the need for extensive construction within Fort Canning Park.
- Value engineering resulted in the design of a shallower station which translated into enhancing the overall safety and productivity of the project.
- A stringent tunnelling regime applying tight volume loss controls and real-time monitoring was implemented during tunnel construction .

C922 – EXPO STATION FOR DTL3

Civil Engineering Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | MERIT



Qualified Person	Engineer Foo See Lim
C&S Consultant	Meinhardt Infrastructure Pte Ltd
Builder	Samsung C&T Corporation
Developer	Land Transport Authority
Architectural Consultant	Greenhill Pte Ltd

KEY CHALLENGES

- The Interchange Station is located underneath a T-junction at Expo Drive and Changi South Ave 1. It also undercrossed the existing East-West Line (Changi Airport Branch) viaduct perpendicularly and causing impact on the existing MRT structure.
- Station construction was obstructed by the existing piles of EWL piers.
- There were existing EWL piers with short pile length within the influence zone. Strengthening the pile group is required to withstand additional forces and deflection induced by deep excavation.

SOLUTIONS

- The design adopted the concept of “Strengthening in advance of undermining”. Construction sequence was set to follow the design strictly.
- New foundation members to resist forces induced by excavation as well as imposed loads from the new and existing MRT structures.
- Transfer beam was constructed below existing pile cap to facilitate preloading to warrant load transfer is effective before proceeding with deeper excavation.
- Incremental deformation of the affected MRT structures was predicted at every stage of excavation. The prediction was used to assess the structural performance by real time monitoring.

D&B ENTRANCE C & D AT DTL3 TAMPINES EAST STATION

Civil Engineering Category

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | MERIT



Qualified Person

Engineer Foo See Lim

C&S Consultant

Meinhardt Infrastructure Pte Ltd

Builder

GS Engineering & Construction Corporation

Developer

Land Transport Authority

Architectural Consultant

ONG&ONG Pte Ltd

KEY CHALLENGES

- Entrance C & D undercrossing road junction at the intersection of Tampines Ave 2 and Tampines Ave 9 were added at the halfway mark of construction.
- There are numerous underground utilities clashing with the original tunnel ERSS. These critical utilities need to be protected during excavation.

SOLUTIONS

- Mining method was introduced to construct the alternative T-shaped subway instead of the conventional braced excavation method which is time-consuming and involving massive traffic and utility diversions.
- The mining tunnel was formed by a series of interlocking steel pipe installed by micro-tunnelling technology. It was optimised to have steel pipes on three sides and precast concrete footing at the base.
- The excavation within tunnel was facilitated by temporary steel frames at regular spacing based on modular design. The overall construction time was reduced significantly with excavation taking place from both ends of the tunnel.
- Sequential block casting of the reinforced concrete lining was carried out to ease the retrieval of temporary steel frames prior to sealing off the construction joints.

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | AWARD



PROJECT NAME

DLT 3 C937 Fort Canning Station & Associated Tunnels

Changi Airport Terminal 4

Tanjong Pagar Centre

The Wave

CATEGORY

Civil Engineering

Institutional & Industrial

Commercial

Institutional & Industrial

QP / QP COMPANY

Engineer Tan Yoong Heng /
Engineer Cheryl Lee Zi Du
Arup Singapore Pte Ltd

Engineer Lai Huen Poh
RSP Architects Planners & Engineers (Pte)
Ltd

Engineer Chia Wah Kam /
Engineer Jason Tan Bok Leng
Arup Singapore Pte Ltd

Engineer Teh Hee Seang
T.Y.LIN International Pte. Ltd.

BCA DESIGN AND ENGINEERING SAFETY EXCELLENCE AWARD | MERIT

PROJECT NAME	CATEGORY	QP / QP COMPANY
National Gallery Singapore	Institutional & Industrial	Engineer Leong Meng Sun CPG Consultants Pte Ltd
Sengkang General Hospital	Institutional & Industrial	Engineer Kam Mun Wai Meinhardt (Singapore) Pte Ltd
Watertown & Waterway Point	Residential	Engineer Kam Mun Wai Meinhardt (Singapore) Pte Ltd
The Venue Residences & Shoppes	Residential	Engineer Dr. Shahzad Nasim Meinhardt (Singapore) Pte Ltd
C922 – Expo Station For DTL3	Civil Engineering	Engineer Foo See Lim Meinhardt Infrastructure Pte Ltd
D&B Entrance C & D at DTL3 Tampines East Station	Civil Engineering	Engineer Foo See Lim Meinhardt Infrastructure Pte Ltd