BCA AWARDS 2020

Recognising Excellence in the Built Environment

DESIGN AND ENGINEERING SAFETY AWARD

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ABOUT THE AWARD

The **BCA Design and Engineering Safety Award** 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 the design, construction and maintenance of building and civil engineering projects, both 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 Design and Engineering Safety Award comprises the following categories:

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

OUTRAM COMMUNITY HOSPITAL (OCH)

INSTITUTIONAL & INDUSTRIAL CATEGORY - EXCELLENCE AWARD

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Qualified Person
Engineer Jason Tan Bok Leng

C&S Consultant
Arup Singapore Pte Ltd

Builder
Penta-Ocean Construction Co., Ltd.

Developer
Ministry of Health, Singapore

Architectural Consultants
B+H Architects
CIAP Architects Pte Ltd

Specialist Consultant
WSP Consultancy Pte Ltd

KEY CHALLENGES

- 19-storey building, with four basement levels, located next to a live hospital campus and critical roads used by ambulances.
- Site was constrained by railway reserve line restrictions, and soil strata composing of Jurong Formation made excavation challenging .
- 300m underground tunnel linking OCH's basement to an existing basement meandering under structures such as the 100-year-old Bowyer Block, a National Monument of Singapore.

SOLUTIONS

- A structural steel system was adopted for the superstructure – with steel columns designed in tiers of three floors – reducing cranage requirements, improving productivity, and avoiding site-welding and prolonged work at-height.
- Pushing boundaries with high-strength Grade 100 concrete-encased steel composite columns adopted, improving productivity, construction speed, and reducing column footprints.
- ERSS design, with rigorous site monitoring and numerical analyses, ensured the sensitive hospital and MRT operations remained unaffected. A semi top-down method was also adopted for basement construction, primarily to achieve speed of excavation and for the stiffness the ERSS required to limit ground movement.
- Bold designs were adopted for the 300m underground tunnel including excavations under and next to existing roads, skybridge, buildings, tunnels and a historic building; carefully considered road diversions, underpinning works, and modifications to existing structures.

SINGAPORE MANAGEMENT UNIVERSITY (SMU) CONNEXION

INSTITUTIONAL & INDUSTRIAL CATEGORY - EXCELLENCE AWARD

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Qualified Person
Engineer Kam Mun Wai

C&S Consultant
Meinhardt (Singapore) Pte Ltd

Builder
Lian Ho Lee Construction (Private) Limited

Developer
Singapore Management University

Architectural Consultant
MKPL Architects Pte Ltd

KEY CHALLENGES

- First on-site net zero energy and well pre-certified building in the city.
- Fast track programme – 15 months construction including piling, main building and ID fitting out work.
- Construction of a two-storey Link Building over Fort Canning Link carriageway, to connect to SMU School of Law.
- Extremely tight site & close proximity to sensitive buildings and services.

SOLUTIONS

- Innovative hybrid Structural Steel – Cross Laminated Timber (SSCLT) System, adopting extensive off-site fabrication of steel frames and CLT floor slabs for the superstructure. The pre-fabricated components were erected on site with simple mechanical connections. This system is extremely light weight, highly buildable and productive. SMUC is the 1st project in Singapore to adopt this hybrid system.
- Structural design innovation adopting the light-weight, highly buildable SSCLT system, coupled with a well-strategised sequence enabled the successful erection of the Link Building structure within seven days over the Fort Canning Link.
- Safeguarding and integration of critical underground infrastructure services into the new building design to avoid diversion and saved time.
- Adoption of Design for Manufacturing and Assembly (DfMA) to other major components like staircases, steel roof, modular M&E and building facade further improved manpower productivity on site. Manpower productivity improvement was estimated at between 50 and over 200% for the various systems.

MAXWELL CHAMBERS SUITES

COMMERCIAL CATEGORY - EXCELLENCE AWARD

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Qualified Person
Engineer Aaron Foong Kit Kuen

Developer
Ministry of Law, Singapore

C&S Consultant
KTP Consultants Pte Ltd

Architectural Consultant
W Architects Pte Ltd

Builder
Guan Ho Construction Co (Pte) Ltd

KEY CHALLENGES

- Sensitive restoration of a century old heritage building with stringent conservation requirements to create new connectivity, improve accessibility and spatial specifications for modern commercial use.
- Intricate structural strengthening solution to enable a new overhead link bridge structures through two conserved heritage buildings' façade without removal of any periphery façade elements around the connection.
- Strengthening of existing foundations within the live electrical sub-station in a safe manner.

SOLUTIONS

- Rigorous engineering analysis with carefully considered loading scenarios and designing detailed construction sequences ensured high margin of safety for the structural integrity of the newly integrated structures while maintaining the key historical features intact at all times.
- Innovative bonded "Z" steel plate detailing served as an elegant composite strengthening solution to support the new overhead link bridge without encroaching into the conserved façade of the heritage buildings and enabling works to be done safely from the inside of the secured buildings.
- Combined foundation strengthening with micro-pile composite foundation cored through the existing shallow foundation that achieved a robust integrated foundation and safe working space with zero disruption to the critical electrical substation operations.
- A highly modular and optimum composite structural steel system using a single beam and single column element type was designed for the two new-built Annex blocks.

THOMSON-EAST COAST LINE CONTRACT T203
TE2 WOODLANDS STATION

CIVIL ENGINEERING CATEGORY - EXCELLENCE AWARD

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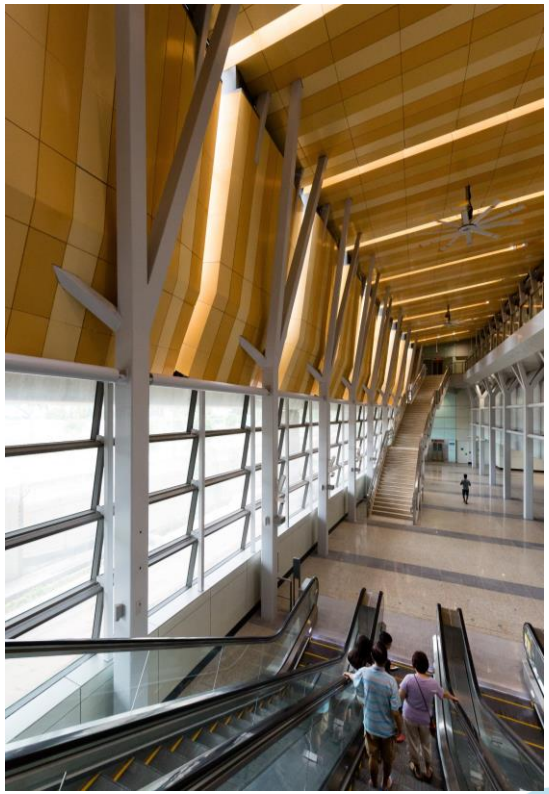

Qualified Person
Engineer Tan Yoong Heng

C&S Consultant
Arup Singapore Pte Ltd

Builder
GS Engineering & Construction Corp.

Developer
Land Transport Authority

Architectural Consultant
Aedas Pte Ltd

KEY CHALLENGES

- TE2 is a two-level underground station with crossover tunnels connected to Woodlands station NS9 interchange via an elevated transfer link. It is also one of the biggest Civil Defence stations in Singapore.
- Constructing the station founded in mixed-face geology profile and around social and transport infrastructure that are operational.
- Designing around and next to a greenfield earmarked for future development.

SOLUTIONS

- Optimising the rail alignment on both ends of TE2 to reduce potential construction risks from the outset, and achieved considerable benefits and conveniences for commuters.
- Placing commuter convenience at the heart of TE2's design, a seamless intermodal transport ambition was achieved with two critical links: an optimised alignment of a slender transfer link bridge between TE2 and NS9, and an underground link from the MRT stations to the bus interchange.
- Considering circular economy principles for the adjacent greenfield, the ERSS wall was designed to be reusable for future excavation and additional knock-out panels were also catered for future construction. This would reduce costs and carbon footprint for future developers.
- As part of the excavation works, maximum safety during detonation was achieved with a rock blasting simulation, and enhanced vibration monitoring at potentially impacted structures. A solid protection system was also implemented to prevent and control fly rock.

Organiser

An Initiative Under