The Award

The Design and Engineering Safety Excellence Award recognises the efforts of the Qualified Person for structural works, his firm and the project team for ingenious design processes and solutions in overcoming project challenges and ensuring safety in the design, construction and maintenance of building and civil engineering projects locally and overseas.

The Award aims to:
- Inculcate a strong safety culture among building professionals in developing our built environment;
- Recognise the Qualified Persons for structural works and their firms for engineering achievements;
- Provide an avenue through which competition for work excellence can be enhanced.

Award Categories

The Award will be given out to the following categories:
- Residential
- Commercial
- Institutional and Industrial
- Civil Engineering
- Overseas

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NANYANG TECHNOLOGICAL UNIVERSITY

Mr Chan Yew Kwong
MINISTRY OF MANPOWER
Marina Bay Sands
ArtScience Museum
Commercial Category

Qualified Person
Er. Brendon McNiven/
Er. Chia Wah Kam

Developer
Marina Bay Sands Pte Ltd

Architectural Consultant
Moshe Safdie Associates in
association with Aedas

C&S Consultant
Arup Singapore Pte Ltd

Builder
Penta-Ocean Construction
Co., Ltd.

Construction Cost
USD $280 Million

Solutions and Features

- 3D modelling played a pivotal role in delivering this challenging project on time. It has helped to resolve complex coordination and documentation issues among designers and consultants.

- In a simple and rational way, Arup found a solution that involved balancing the structure in space and dealing with complex geometry. The overlapping geometrical shapes of the flower petals are supported through large finger-like trusses arising radially from the central diagrid core.

- Part of the architectural intent was to maintain a transparent and open view through the core of the building. Arup developed an elegant fluted diagrid structure that fitted seamlessly into the architecture. The result was a clear line of vision through the elegant diagrid core to the blue sky above while the massive white petals cantilever out in all directions.

Challenges

- The ArtScience Museum has an extremely unique and challenging three-dimensional structural form.

- The shape of the museum is non-symmetrical and is built to resemble a lotus flower on an outstretched hand. It comprises two levels and ten petals of varying heights and widths on a radial axis, spaced evenly at 360°.

- Completing the project within a short time frame required good management of the construction sequence and efficient organisation.
ITE Headquarters and ITE College Central @ Ang Mo Kio
Institutional & Industrial Category

Qualifed Person
Er. Lai Huen Poh

C&S Consultant
RSP Architects Planners & Engineers (Pte) Ltd

Builder
Kajima Overseas Asia Pte Ltd

Developer
Institute of Technical Education

Architectural Consultant
RSP Architects Planners & Engineers (Pte) Ltd

Construction Cost
S$ 388 Million

Challenges

• Tight construction schedule to construct 10 blocks for various usages, with a Gross Floor Area (GFA) of 192,820 m² within 80 weeks.

• Limited access to the site due to access and height restrictions as a result of nearby military camp and the Central Tunnel Expressway (CTE).

• Complex design due to large scale, long span and high volume of space.

Solutions and Features

• Extensive use of modular pre-cast structural elements and prefabricated steelworks to meet architectural requirements and improve productivity, site safety and quality.

• To allow future reconfiguration of space and usage; regular column grids, long span between columns and dry wall partitions were adopted.

• The project was designed to minimise deep basement construction which reduced the cost and risk of constructing temporary earth retaining structures.
Mount Elizabeth Novena Hospital
Institutional & Industrial Category

Qualified Person
Er. Dr. Tan Guan

C&S Consultant
T.Y.Lin International Pte. Ltd.

Builder
Penta-Ocean Construction Co., Ltd.

Developer
Parkway Novena Pte Ltd
and Parkway Irrawaddy Pte Ltd

Architectural Consultant
Consultants Incorporated Architects + Planners

Construction Cost
S$ 361 Million

Solutions and Features
• Extensive geotechnical investigation was conducted to map out rock contours and a top-down method of construction was adopted to deliver the project within the 24-month contract period, with no compromise in quality and safety.
• Worked closely with Acoustic and Security Consultants for efficient engineering solutions.
• Adopted modular designs for ease of construction and flexibility in layout changes.
• Overcame site constraints through innovative design approaches.

Challenges
• The undulating site terrain and geological contours of Bukit Timah Formation posed challenges in the foundation and basement designs of the hospital.
• The fast track project required special design and engineering safety considerations, including structural stiffness and radiation shielding for sensitive medical equipment, and building robustness against disproportionate collapse.
• At the western boundary where a 1.8m wide box drain within the 3.4m wide drainage reserve was constructed, the existing boundary rubble and retaining brick walls were generally in dilapidated conditions.

• Extensive geotechnical investigation was conducted to map out rock contours and a top-down method of construction was adopted to deliver the project within the 24-month contract period, with no compromise in quality and safety.

• Worked closely with Acoustic and Security Consultants for efficient engineering solutions.

• Adopted modular designs for ease of construction and flexibility in layout changes.

• Overcame site constraints through innovative design approaches.
NUS Link Bridge
Civil Engineering Category

Qualified Person
Er. Yong Fen Leong

C&S Consultant
T.Y.Lin International Pte. Ltd.

Builder
Sato Kogyo (S) Pte. Ltd.

Developer
National University of Singapore (NUS)

Construction Cost
Contract: $33 Million
(bridge only: $20 Million)

Challenges

• Constructing a bridge linking Kent Ridge Campus and University Town that spans 10 busy traffic lanes of Ayer Rajah Expressway while ensuring minimal impact on traffic and public safety.

• Working with height constraints as the bridge is built across existing roads and a fixed corridor with existing buildings in close proximity.

• Ensuring two 50m cantilevers meet with stringent construction tolerance and precision.

Solutions and Features

• To minimise impact on traffic and public safety, a 100m bridge segment over the AYE and precast segmental cantilever technology was adopted to do away with temporary structures on the AYE. Also, construction which required road closure was done during off-peak hours between 12am to 5am.

• All foundations and cast in-situ structures are located away from major roads thus minimising safety risks.

• The bridge was designed with an S-curve alignment, yet fulfilled standard road geometry requirements for traffic safety.

• Long-line precast construction ensured that the segment alignments are close to perfect while precise pre-camber analyses and careful site control ensured that the curved cantilevers met at the mid-span with only 10mm vertical difference and 25mm lateral difference with the 50-meter cantilever from each support pier.

• Bridge analyses captured all stages of construction, segment launching and curved bridge behaviour while the pre-stressing detailing included the asymmetrical tendons profile for the bridge curvature.
Downtown Line Phase 1 - Contract 906 Bayfront Station and Tunnels

Civil Engineering Category

Qualified Person
Er. Lim Soon Hui

C&S Consultant
AECOM Singapore Pte Ltd

Builder
Sembawang Engineers and Constructors Pte Ltd

Developer
Land Transport Authority

Architectural Consultant
Aedas Pte Ltd

Construction Cost
S$ 463 Million
(Station & Tunnels)

Challenges

• Bayfront station and tunnels are sited on reclaimed land next to Marina Bay Sands Integrated Resort (MBSIR), Common Services Tunnel (CST) and URA’s development sites.

• Designing a safe earth-retaining structure for the station and tunnels (Circle Line and Downtown Line) to meet the opening of MBSIR within two years of fast track construction.

• Deep excavation up to 28.5m deep in 30m thick marine clay before reaching competent Old Alluvium strata varying from 17m to 40m below ground.

Solutions and Features

• Diaphragm wall construction with top-down approach for the station and bottom-up approach for the tunnels, to enable safe and on-time delivery.

• Continuous design development and interfacing with adjacent MBSIR, CST and URA developments to ensure minimal disruption to other ongoing construction activities.

• Implementation of instrumentation programme to monitor the design against the actual performance of the earth-retaining structure.

• Appropriate use of soil parameters in the design approach and method of construction.

• Appropriate planning of traffic diversion and construction sequence.
Volari at Balmoral Road
Residential Category

Qualified Person
Er. Song Wee Ngee

Developer
City Developments Limited

C&S Consultant
KTP Consultants Pte Ltd

Architectural Consultant
Architects 61 Pte Ltd

Builder
Tiong Seng Contractors Pte Ltd

Construction Cost
S$ 70 Million

Challenges

• Unique design of curvilinear external façade involving long-span cantilever balconies, protruding Reinforced Concrete (RC) fin walls and external staircases.

• Transfer slab at the high volume lobby.

Solutions and Features

• Precast system was adopted to minimise the wet works. Erection of temporary supporting structures on site improved the quality of the finished product.

• Steel staircases were adopted to replace the RC staircase to improve site productivity.

• Precast RC planks were adopted to eliminate the use of formwork and cast with the transfer plate.

• Cobiax ® Slab System was adopted to reduce concrete usage.
The Residences at W Singapore – Sentosa Cove
Residential Category

Qualified Person
Er. Song Wee Ngee

C&S Consultant
KTP Consultants Pte Ltd

Builder
Dragages (Singapore) Pte Ltd

Developer
Cityview Place Holdings Pte Ltd

Architectural Consultant
Axis Architecture Planners Pte Ltd

Construction Cost
S$ 198 Million

Challenges

- Designing and constructing the raft foundation in Sentosa Cove atop reclaimed land with undulating subsoil profile and uncertainty on the quality of the backfilled sand.
- Ensuring the settlement of the raft foundation is within the acceptable limit under long term conditions.
- Close proximity to the seawall and sluice gate separating the site into two parts with no foundation to be installed within the sluice gate protection zone.

Solutions and Features

- Creatively improving the soil quality using a combination of Deep Cement Mixing (DCM), soil replacement and bored pile foundation, thus making raft foundation possible on the reclaimed sand.
- Extensive in-situ tests are carried out to validate the analytical soil model and verify the long term settlement of the raft foundation through monitoring.
- Effective planning and collaboration with the builder while designing the temporary work during excavation and ensuring the stability of the seawall.