The Award

Into its second year, the BCA Design and Engineering Safety Excellence Award aims to give recognition to the efforts taken by 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.
Award Categories

- Residential
- Commercial
- Institutional & Industrial
- Civil Engineering
- Overseas Projects

Assessment Committee

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BCA Board Member
Deputy Managing Director,
Tiong Seng Contractors (Pte) Ltd

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Institution of Engineers Singapore

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National University of Singapore

Er Lai Huen Poh
RSP Architects Planners & Engineers Pte Ltd

Er Lim Chong Sit
Association of Consulting Engineers Singapore

Er Dr Shahzad Nasim
Meinhardt (Singapore) Pte Ltd

Ms Rita Soh
Singapore Institute of Architects

Er Dr Tan Teng Hooi
Nanyang Technological University
T Y Lin International (SEA) Pte Ltd (Oct 08 - present)

Er Yap Tiem Yew
Housing and Development Board

Er Ong See Ho
Building and Construction Authority
Design and Engineering Safety Excellence Award

**The Sail @ Marina Bay**
(Residential Category)

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<tr>
<th>Award</th>
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| Qualified Person | Er Dr Shahzad Nasim |
| --- |
| C & S Consultant | Meinhardt (Singapore) Pte Ltd; Precast Design Consultants Pte Ltd |
| Builder | Dragages Singapore Pte Ltd |
| Developer | City Developments Ltd; AIG Asian Real Estate Partners, L.P. |
| Architectural Consultants | NBBJ Ltd (New York); Team Design Architects Pte Ltd |
| Construction Cost | Approx. $300 million |

**Challenges:**

- Singapore’s tallest residential building with towers that are among the most slender buildings in the world.
- Designing and constructing the huge development (1,111 units) in a congested site located over existing MRT subway tunnels and on reclaimed land within 40 months.

**Solutions and Features:**

- Creative orientation of the development to avoid locating the twin towers directly over the MRT tunnels.
- Devised an innovative parallel-coupled-shear-wall system to resist building gravitational and design seismic forces whilst limiting the sway and acceleration.
- Devised a strut-free multi-cellular diaphragm wall temporary earth retention system to eliminate disruption to MRT operations and adjacent construction.
- Modular and repetitive structural framing reduced typical floor-cycle-time to only 5 days while achieving an exceptional structural CONQUAS score of 99.5.
- High strength (Grade 80) concrete for the buildings was developed to minimise perimeter column sizes and mitigate differential vertical movements between various elements.
Design and Engineering Safety Excellence Award

**Henderson Waves**  
(Civil Engineering Category)

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<tr>
<td>Qualified Person</td>
<td>Er Lai Huen Poh</td>
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<tr>
<td>C &amp; S Consultants</td>
<td>RSP Architects Planners &amp; Engineers (Pte) Ltd; Adam Kara Taylor Consulting Civil and Structural Engineers, UK</td>
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<tr>
<td>Builder</td>
<td>Evan Lim &amp; Co Pte Ltd</td>
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<tr>
<td>Developer</td>
<td>Urban Redevelopment Authority</td>
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<tr>
<td>Architectural Consultants</td>
<td>RSP Architects Planners &amp; Engineers (Pte) Ltd; IJP Corporation Ltd, UK</td>
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<tr>
<td>Construction Cost</td>
<td>$12.43 million</td>
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**Challenges:**
- Design for structural robustness and serviceability due to complex and three dimensional skeleton form of the footbridge as well as fabricating it.
- Assembling and erection of the 57-metre span of the footbridge that crosses above Henderson Road.
- Protecting the existing and extensive underground services above footbridge footing.

**Solutions and Features:**
- Sophisticated 3D structural models for static and dynamic analysis were performed by competent staff.
- Tuned mass dampers incorporated into the structural system to balance the resonant vibration if a group of people runs on the 57-metre span footbridge.
- A comprehensive set of temporary towers with condeck platforms was deployed to protect public vehicles from falling debris during footbridge assembly.
- Strand Jacks lifting system used to erect the footbridge deck.
Contract 423 Kallang/Paya Lebar Expressway
(Civil Engineering Category)

Challenges:
★ The 3-kilometre KPE tunnel passes directly beneath the Pelton Canal and through a highly urbanised environment.
★ Deep excavation up to 50 metres in soft marine clay and highly variable ground was done in very close proximity to high rise structures.

Solutions and Features:
★ As full diversion of the canal was not possible for a 1.2 km section of the route due to restricted width, the canal was diverted in multiple stages to allow the tunnel to be constructed in two halves.
★ Multiple solutions for the temporary works were adopted including D-walls, T-panel walls and Cross Walls. A large number of design zones were selected for analysis in order to capture the variations in construction sequence, structure geometry, foundation type, geology, retaining wall type and building assessment requirements.
★ Transverse diaphragm or ‘cross’ walls were adopted in order to limit wall movements of temporary works.
**Parc Emily Condominium**  
*(Residential Category)*

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<th>Qualified Person</th>
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<tr>
<td>C &amp; S Consultant</td>
<td>LSW Consulting Engineers</td>
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<tr>
<td>Builder</td>
<td>Tiong Seng Contractors (Pte) Ltd</td>
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<tr>
<td>Developer</td>
<td>City Developments Limited; TID Pte Ltd</td>
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<tr>
<td>Architectural Consultant</td>
<td>ADDP Architects</td>
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**Challenge:**
- Lodged in a geographically challenging (sloping) terrain with presence of old buildings (shop houses, carpark, church) and a narrow accessway at Mount Emily Road.

**Solutions and Features:**
- Secant pile retaining wall (approx 18-metre high) acted as a temporary earth retaining system during excavation. It also served as a permanent wall upon completion of the development.
- The use of a single layer of ground anchor also accelerated construction time significantly.
- Raft foundation was used instead of piling to eliminate noise pollution and vibrations.
- Construction sequence was greatly simplified due to use of the secant pile system together with the ground anchor and raft foundation. These solutions also mitigated risks for workers and were time-efficient.
Challenge:
★ To design and construct the nine-storey hotel on an existing Terminal 3 basement carpark within 17 months.

Solutions and Features:
★ Providing engineering solutions for the design and planning of the architectural spatial design intent, hotel functional requirements, as well as maintaining the existing basement carpark structure and foundations without underpinning or structural strengthening.
★ Integrating transfer beams at third storey to support both the hotel guest room grid and the swimming pool deck and lush landscaping requirements.
★ Floral motif supported by modular frames on the building envelope.
St Regis Hotel & Residences
(Commercial Category)

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**Challenges:**
★ Presence of organic clay and peat required careful planning and construction for deep basement works.
★ Construction site is surrounded by three busy roads and a nearby old two-storey bungalow.

**Solutions and Features:**
★ Reduction of one basement to avoid deeper excavation and use of existing box-canal structure along Tanglin Road to act as a temporary retaining system. The design is more economical and much faster, safer and cost effective to construct.
★ Use of precast structures, unitized curtain wall and prefabricated ceramic cladding to eliminate external scaffolds and safety netting erection.
★ Extensive ground instrumentation to monitor movements due to basement works so as to eliminate damages to surrounding building structures and services.
## Design and Engineering Safety Excellence Award

### Marina South Pier
(Institutional & Industrial Category)

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<td><strong>Architectural Consultant</strong></td>
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### Challenge:
★ The new waterfront gateway terminal’s main challenge is to complete the fast-track development in a safe and efficient manner in the marine environment.

### Solutions and Features:
★ Use of highly modular and repetitive space truss system to support the unique wavelike roof structure that forms a triple volume space with 9-metre cantilever glass canopy.
★ Extensive use of standardization and modularization, in conjunction with prefabrication and precast technology in the building and 950-metre long jetty structures to increase buildability, efficiency and site safety.
★ Implementation of systematic site, environmental management system and occupational health and safety system to minimise the impact to the environment and create a safe work environment.
Challenges:
★ Contract 825 is part of the Circle Line Stage 1 that includes four underground stations at Dhoby Ghaut, Bras Basah, Esplanade and Promenade with 2.6km associated bored and cut/cover tunnels. It involved excavation up to 35-metre deep in Marine Clay within the Kallang Formation geology with Old Alluvium and Fort Canning Boulder Bed (FCBB) through an urban area beneath roadways and adjacent to sensitive buildings.
★ It also involved major additions and alterations below existing Dhoby Ghaut Station with operational North-East Line (NEL) and North-South Line (NSL) stations.

Solutions and Features:
★ The choice of Top-Down construction method with diaphragm walls for the deep excavations at Bras Basah, Esplanade and Promenade stations followed by rapid temporary road diversion schemes.
★ Site monitoring and instrumentation with a robust and safe TERS scheme through active and passive ground settlement control with usage of recharge wells and pre-installed jet grouting struts.
★ For Dhoby Ghaut station, unique and creative underpinning using caissons below the existing B2-Link columns with functional travellator linking the NSL and NEL to enable two levels basement construction below the existing Dhoby Ghaut Station Concourse level.
★ The tunnel was constructed using New Austrian Tunnelling Method (NATM) in between existing lines and below urban architecture development.