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Penta-Ocean Construction and Singapore Path of Overcoming Challenges 1

Contract T232
New Railroad Construction Project Linking Singapore to Malaysia
High Recognition Given to Project Feasibility and Quality

Singapore is a dynamic and vibrant city state lined with towering skyscrapers. At the core of these modern and beautiful streetscapes lies the tireless efforts of the construction industry, where local and international players fiercely compete with one another.

Among the long list of Japanese construction companies, Penta-Ocean Construction, which celebrated the 60th anniversary of entering into Singapore in 2024, was one of the first Japanese companies to arrive in the country. Since then, the company has made significant contributions to a number of iconic projects by leveraging high engineering capabilities and technical expertise. However, the road to success in a foreign country had many twists and turns, including different business practices, language barriers, as well as a cut-throat competition. Despite these difficulties, POC's commitment to addressing tough challenges paved their way towards a distinguished position established in the market. In this report, we will introduce some ongoing projects that POC undertakes in Singapore and the pinnacle of the sustainability that the company strives for.

Project site

At the northern part of Singapore, POC currently undertakes the Contract T232, which involves the construction of a new railroad facility connecting Singapore and neighboring Malaysia. On a vast site of approximately thirty hectares, the construction of the Customs, Immigration and

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Quarantine Building, a station building and RTS link tunnels is underway. POC is solely responsible for this huge project with a total construction cost of approximately 71.4 billion yen (at the time of the order).

If you gaze to the north from the project site, the tall buildings of Johor Bahru, the southernmost city in Malaysia, come into sight. Although Johor Bahru is within a stone's throw away from Singapore, the carriageway connecting the two countries are plagued by chronic traffic congestion. Once the new RTS Link project is completed, the trip between the countries will be shortened to only 15 minutes. By connecting the linkway to the Woodland North Station, which was also constructed by POC in the past, the access to the city center of Singapore will be improved significantly.

The Contract T232 required excavation of as much as 1.35 million cubic meters of earth and sand prior to the construction of the large-scale structure and the tunnels, but the extremely hard bedrock made the work difficult. Project Director Keiji Uchida explains, “The excavation required blasting of the hard bedrock with explosives, and it was a series of struggles.”

Although POC had been well aware of the complex conditions of this particular section, they dared to take on the challenge. As POC had previously undertaken the construction of the Woodland North Station, which will be directly connected to the new RTS line, The Land Transport Authority of Singapore (LTA), the client, prioritized the project feasibility and construction quality over a low price.

Currently, soil excavation and pile driving have already been completed, and going forward, the project will move on to the building construction works, which will involve a large team comprised of 2,000-workers. The project had previously faced challenges including the COVID-19 crisis, and Uchida emphasizes high expectations set for this project, commenting, “We are working under a great pressure every day, and we understand that there is very little margin for delays”. He is determined to leverage his past experience and expertise to ensure the success of the project, while putting efforts into training younger generations of the project members.

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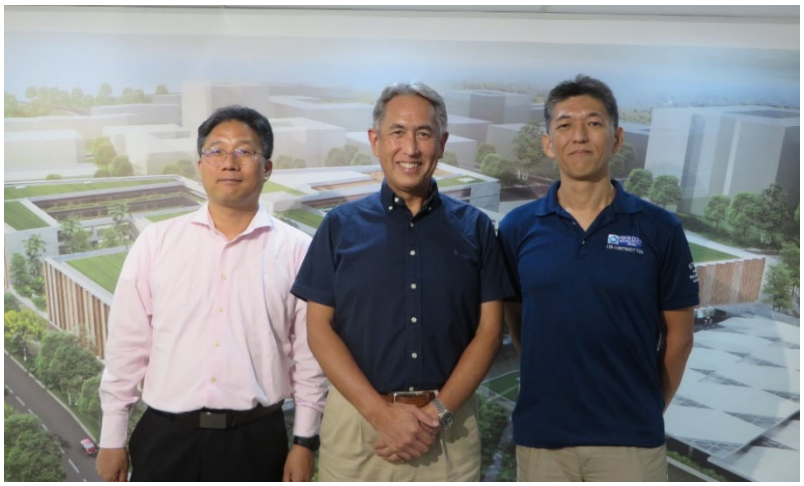

(from right to left) Naoki Hoshi, Project Manager,
Keiji Uchida, Project Director,
Kim Yeounhwan, Administration Manager

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Penta-Ocean Construction and Singapore Path of Overcoming Challenges 2

ECC&NDCS

Earning a Well-established Reputation in Hospital Construction by Responding to the Country's Needs for Medical Services

Achieving High-Quality by Introducing Innovative Technologies

Although Penta-Ocean Construction (POC) started out with marine civil engineering projects in Singapore, the company has since constructed a number of iconic building construction projects, including Esplanade Theatres on the Bay, VivoCity and ION Orchard. In the building construction field, one of the most rapidly expanding sectors is hospital and healthcare construction. To meet the ever-rising needs for medical services in Singapore, POC has accumulated the track records and over the last fifteen years, undertaking almost half of the total number of hospitals in the country, which is a cut above any foreign-based contractor, or any Japanese mega contractor, also known as super general contractors.

Project site

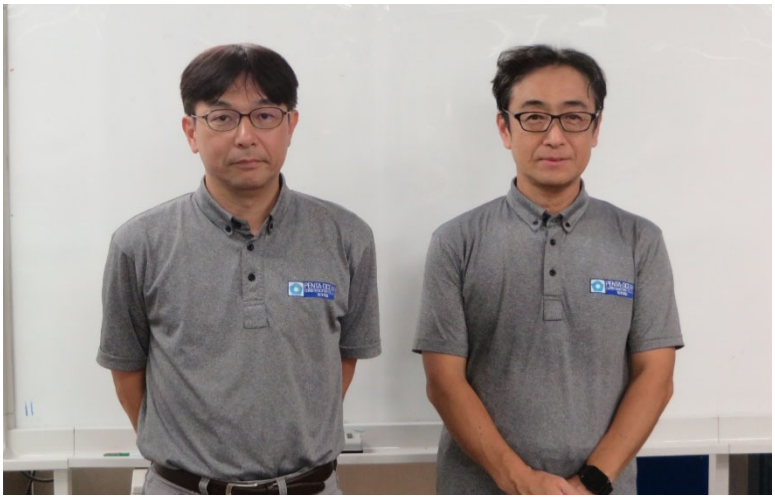
Currently, POC undertakes a new construction of Elective Care Centre (ECC) and National Dental Centre of Singapore (NDCS). The new building will be about 150,000 m^2 medical facility with twenty stories above ground and four stories of basements. The contract amount is approximately JPY 80.6 bn (at the time of the order). Both facilities are part of the Singapore General Hospital (SGH), and the ECC will be dedicated to non-emergency surgeries and procedures, whereas the NDCS, on top of general dental care service, will also provide training for future dental professionals and feature the integrate digital dentistry and technology in the services. The 300-bed hospital will be housed as well as operating theatres, dental operatories, department of diagnostic radiology, parking lots, food services, a sterile supply unit and so on.

To expedite basement structure construction in a hard soil underground, the POC project team adopted the semi-top-down construction method, in which large temporary muck hole openings were generated. Basement structure is constructed first, then superstructure work, followed by

M&E works and architectural finishing works. As a new technological initiative, Design for Manufacture and Assembly (DfMA, a designing methodology focusing on simple manufacturing and efficient assembly) was also introduced. With this methodology, ducts, pipes and cable racks are fabricated in a unit and installed on site which leads to expedited construction. Project Director Yoshinori Yamano emphasizes the advantages of the method, commenting, "This method was particularly effective because hospital construction involves a number of complex mechanical and electrical services."

The active use of BIM in this project from design, construction to facility's maintenance & management is also unique to Singapore, an advanced nation in Digital Twin technology. As BIM modelers are often non-Singaporeans and hard to find in Singapore, the POC project team outsources BIM related services to two Indian companies. With BIM technologies, not only do they provide 3D visualization of the building to be constructed, but they also physically constructed mock-ups of patient rooms and the building facades so that the architect and hospital end users can review constantly. These approaches pursue optimal usability for hospital end users as well as the high- quality features.

The projects team consists of various members including Ministry of Health Singapore (MOH, the client), Singapore General Hospital (the future operator of ECC and NDCS), Project Manager and the local consultant firms. "The project is within the site of the SGH's campus, in full view of public eyes including the client, and that adds another pressure to the team," says Yamano candidly. And yet, the company dares to tackle bigger and tougher challenges once again, and commits themselves to achieving project goals, including, 1. delivery on time, 2. cost control within budget, 3. high quality standards, 4. zero major accidents and 5. zero impact to the hospital.



Yoshinori Yamano, Project Director (right) and Kazunari Ikeda, Project Manager

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Penta-Ocean Construction and Singapore Path of Overcoming Challenges 3

N105
Excavation of the Interface Section with the MRT line
Tackling a Complex Challenge with Japan's Technology

Singapore's majestic skyline of towering skyscrapers is a breathtaking sight, but if you take a moment to look down, their extensive road network development is also worthy of attention. Within its limited land space, the country employs multifaceted strategies and mechanisms to minimize traffic congestion and facilitate the flow of its people and goods. In the construction of Singapore's eleventh expressway called the North South Corridor, Penta-Ocean Construction (POC) is the only Japanese contractor to participate in the project. POC was awarded the particularly complex MRT-interface section frequented by vehicles, and for that reason, POC's presence onsite is broadly prominent amongst other players.

Project site

The North South Corridor Project is a megaproject which involves the construction of a north-south transport corridor covering a 21.5km stretch, which consists of the 12.3 km-long underground tunnels and the 8.8km-long elevated viaduct. In the Contract N105 undertaken by the JV of POC and a French general contractor, the team will construct a 1km-long underground expressway by using stacked box-culvert structures for a four-lane carriageway configuration. The contract amount for JV is JPY 64.2 bn, and POC's portion is JPY 37.3 bn (both at the time of the order).

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The highlight of the project lies in the intersection part with the existing MRT line, where the interface is constructed by two box culverts sandwiching the existing MRT line. Evidently, the procedure requires top-notch technical prowess. The clearance of the box culvert above and the MRT line is as little as 1.5m. To tackle the impossible challenge and avoid any influence on the live MRT line, the SFT Method, a patented technology of Japan, was introduced to provide a pragmatic solution.

The STF Method is a tunnel construction method without the conventional tunnel-face cutting. The small rectangular propulsion steel tubes are being installed in advance along the circumference of box culvert followed by cast Box Culvert behind those steel tubes. The pre-cast Box Culvert together with steel tubes containing the soil mass inside are extruded forward, and simultaneously installing the culvert structure. The procedure can be performed while maintaining the earth pressure applied to the MRT tunnel.
The project involves the construction of an expressway, as well as the development of an underground pedestrian network (UPN). The UPN is designed to be directly linked to the space created between the stacked Box Culverts and reserved for a future commercial facility, showcasing Singapore's tactical approach to make effective use of limited land area.

On top of the complexity of the construction itself, on the surface level above the site runs a busy thoroughfare frequented by considerable vehicle traffic. As the area is dotted with commercial facilities, educational institutions, residential buildings and public facilities, considerations for the surrounding environment and close monitoring of construction noise are paramount. Consequently, the team employs noise abatement and control measures which comply with standards established by the National Environment Agency, including installing noise meters in sixteen locations to ensure around-the-clock monitoring across the site.

Project Director Toshio Araki enthusiastically comments, "This is a project that receives significant attention from the client, and we definitely want to live up to their trust." Although the economic disparity between Japan and other Asian countries is diminishing, he says that other Asian countries still hold certain respect toward the Japanese. "I want to prove that there is no doubt about it." he comments, emphasizing the technological capabilities known as "Japan Quality" that he and his team have been striving for over the decades.

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Project Director Araki (right) and Ryo Tajima, Senior Staff Member

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The 60th Anniversary and Beyond
The Inauguration of the Sustainability Award
An Incessant Journey of Innovation and expansion

"Under the slogan of 'Sustainability initiatives start on sites', we shall keep transforming and evolving along with the company itself!" Takuzo Shimizu, President, CEO and Representative Director, addressed to the employees of Penta-Ocean Construction (POC) and local subcontractors at the "Sustainability Award 2024", which was inaugurated in Singapore.

The Sustainability Award

With a keen focus being placed on sustainability of social infrastructure primarily due to climate change etc., the importance of sustainability of the construction industry which plays a crucial role in the development and maintenance of social infrastructure, should not be overlooked. Amidst such challenges, POC pursues sustainable corporate growth while tacking sustainability issues from a global and ESG (Environment, Society and Governance) perspective.

The Sustainability Award is a new initiative of POC, in which employees individually select an ESG-related theme from issues commonly shared at construction sites, followed by the public presentation of their research. This year, thirteen entries were registered by staff members at POC sites or local subcontractors in Singapore. After careful deliberation, a total of four entries (three teams and one individual) received the excellence award.

The works of the excellence award winners covered multifaceted aspects, including CO_2 reduction,

productivity improvement, onsite food production and onsite operational reforms by digital transformation. On top of the uniqueness of the theme, their presentations contained clear visualization of the underlying data and quantitative effects of their initiatives. The participants, including the presenters, were of all ages and genders, and each individual seemed to enjoy being involved in the Award, which was the most impressive part of all.

During the presentations, the presenters received questions from the audience that referred to the further development of their initiatives, such as how they would propose to use the time created by productivity improvement, or how they would ensure implementation of the initiative across organization. The presenters spoke uniformly of the significance of their participation in the award, which showcased the importance of sustainability-consciousness in business activities and corporate actions. On the following day of the award ceremony, Ms. Hiroko Kiba, a freelance news presenter, gave a lecture. She emphasized the importance of sustainability initiatives generated from construction sites, saying " For corporate employees to continue to thrive and grow, it is paramount that they realize how much their company contributes to social development."

When President Shimizu of POC greeted at the ceremony commemorating the 60th anniversary of their expansion into Singapore, he assertively commented, "One of the keys to our success in Singapore lies in our human resources." Of approximately 700 employees at POC's Singapore headquarters office, 60% are Singapore nationals and Permanent Residency holders, and more and more important positions are filled by Singapore nationals. As the localization of the organization advances, they also strive to acquire 100% ownership of/enhance alliances with local engineering and construction companies.

For sixty years, POC has been pioneering excellence in the competitive landscape of the construction industry in Singapore. While tackling technically complex projects with top priorities placed on safety and high-quality, POC looks into the sustainable future with a higher and broader perspective. "Penta-Ocean commits to further innovation and expansion, preparing ourselves to meet future construction demands".

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The 60th Anniversary Commemorative Ceremony

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