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# CSR Together with the Development of Singapore

In 1964, Penta-Ocean Construction received an order for the construction of one pier in Singapore. It has now been about 50 years since our activities in Singapore started. During this time, we have been involved in many projects, including large public works projects and high-rise building construction projects.

In this special report, we introduce the history of the Company in Singapore over the past half a century and some of our projects that are advancing toward further development in the future.

## 50 Years of Building Singapore and Contributing to Economic Development

### Infrastructure Development Promoted by the Government

Singapore, which is located in Southeast Asia, is a new nation that gained its independence from the Federation of Malaysia in 1965. In Singapore, which lacks natural resources and major industries, active introduction of foreign capital and social infrastructure have been promoted in order to give the country a financial independence. The country has achieved remarkable development by establishing ports and airports and building industrial and residential districts aiming to become the "Hub of Asia."

### Penta-Ocean Construction and Singapore: Half a Century of History

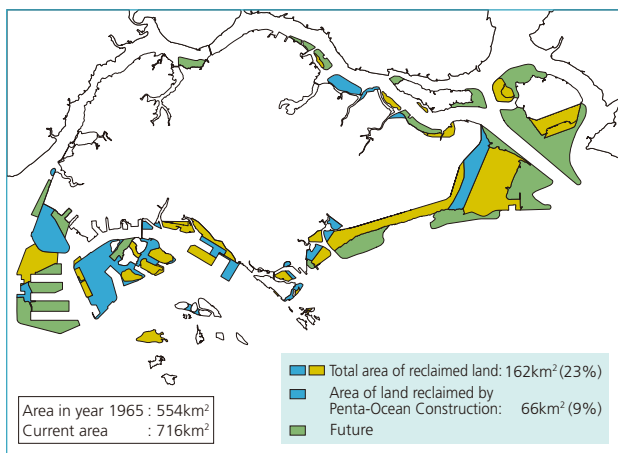
The Company took the first step of advancing into Singapore with the "Jurong Dock Redevelopment" in 1964 before the nation gained its independence. After this, we received orders for large-scale reclamation projects, such as "Changi International Airport Reclamation Project" and "Reclamation of Jurong Island Project." At present, the area of Singapore is 716km<sup>2</sup> (slightly larger than Tokyo), but prior to landfill this was 554km<sup>2</sup>. An area of 162km<sup>2</sup> – equivalent to approximately 23% of the area of the nation – is reclaimed land. Of this, the Company was responsible for 66km<sup>2</sup> – approximately 10% of the nation and approximately 40% of the reclaimed land.

In other civil engineering fields, we have been deeply involved in the establishment of infrastructure that supported the development of this country, including the "Pasir Panjang Container Terminal Project," which plays a part in the logistics of the port, and the public works project of the "Deep Tunnel Sewerage System."

In the construction field, we have worked on a number of projects. These include "Wheelock Place" designed by the late Kisho Kurokawa, "Singapore Post Centre," "Esplanade-Theatres on the Bay" and "ArtScience Museum" that have become landmarks of the Marina Area, "VivoCity" that is a commercial facility designed by the architect Toyo Ito and the high-rise complex "ION Orchard and the Orchard Residences."

### Toward Being the No. 1 Contractor in Singapore Based on the Trust We Have Built Up

Singapore is now ranked number eight in the world for GDP per capita and has achieved development that is called the "Asian miracle." The Company has built up a good relationship of trust by having been involved in infrastructure development and frequently overcoming challenging construction projects. In the future, we will continue to further contribute to the prosperity of Singapore by taking advantage of the valuable experience and technical capabilities we have built up over the years.

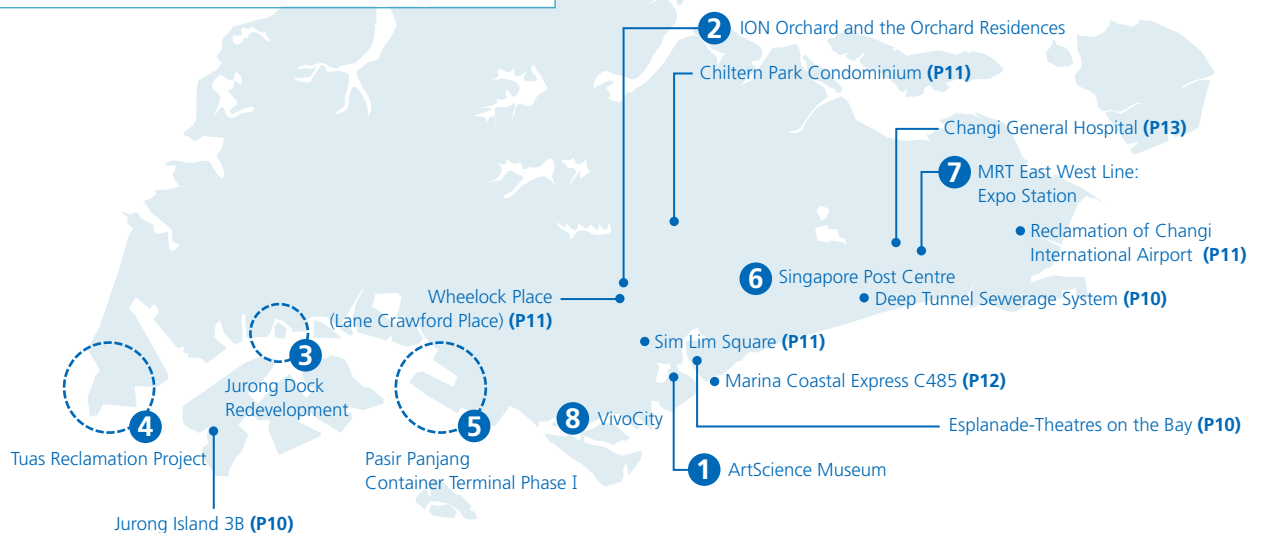


## Our Track Record in Reclamation Projects

\*This map was created when aggregating our track record in landfill projects.

\*The January 2013 presentation materials of the Singapore Ministry of National Development have been referred to for the landfill projects.

## SINGAPORE





## Good Partner to Singapore

This year, we are celebrating 50 years since we first expanded into Singapore. This is the result of the cooperation of our customers, government agencies, various institutions and everyone in the region, as well as the hard work of all our predecessors in this Company. Thank you all very much.

I was first assigned to a position in Singapore in 1989. At that time, there were few high-rise buildings and I remember that the old town was still there. Later, after working in Japan, I was again assigned to a work in the country in 1996, but I was surprised by the complete change in the scenery when I looked at the office district lined up with skyscrapers and hotels in the tourist district.

Looking back on the past 18 years, there were various events in the process of establishing the current position

of Penta-Ocean Construction in Singapore, such as the orders we received for numerous large public works projects and construction projects that have now become landmarks.

The process in which we have now come aiming to be No.1 contractor in Singapore started from maritime public works projects which are the specialty of our Company and encompasses a historical growth in which we have to undertake public works projects and construction projects on land.

Singapore in recent times has continued to grow further and develop at remarkable speed. We will also continue to improve and grow so that we can be a partner to Singapore with the nickname of "Penta-Ocean" in the next five, ten and fifty years.



General Manager  
Singapore Office

Kazushi Yamashita

## Chronology of Orders from Singapore

(The numbers show the fiscal year when the order was received)

### 1960

- 1963 - Jurong Dock Redevelopment
- 1967 - HDB Housing Foundation Works

### 1970

- 1974 - HDB Reclamation Works at East Coast
- 1975 - Reclamation of Changi International Airport
- 1976 - Singapore Petrochemical Plant Site Reclamation

### 1980

- 1980 - Berth Project for Esso Singapore
- 1983 - Sim Lim Square  
- Jurong Tuas Reclamation
- 1985 - HDB Reclamation at Punggol
- 1989 - Chinatown Point Building

Completed in 2001

### Reclamation of Jurong Island Phase 3B



This is a part of the project to develop a major chemical island connecting seven islands located in the southwestern part of Singapore into one. In this project, we constructed a landfill with an area of approximately 980ha (equivalent to approximately 645.5km<sup>2</sup> of the nation at that time). The Company received orders in each period of construction and is still continuing to work on this project.

Completed in 2002

### Esplanade-Theatres on the Bay



This is the world-famous National Art Center with an appearance like that of a durian fruit. Although facing a road with heavy traffic and Singapore River, the Concert Hall has realized an ultra-quiet space that shuts out all noise. This is an important facility that promotes the cultural level not only of Singapore but the world.

Completed in 2005

### Deep Tunnel Sewerage System



These are large tunnels with an inside diameter of 6m and a length of 7.7km at a depth underground of 35-45m, a sewer tunnel development project. The drilling distance in one encapsulated shield (soil pressure shield) and was the world's longest at that time. Although having a rough spot with both soft and hard ground, we maintained high-speed construction of an average 15m per day over a two year period.

1990

- 1991 - Wheelock Place (Lane Crawford Place)
  - Reclamation Works at Marina Bay and Tanjong Rhu
- 1992 - Chiltern Park Condominium
- 1993 - Pasir Panjang Container Terminal Phase I
- 1996 - Singapore Post Centre
- 1998 - MRT East West Line: Expo Station
  - Esplanade-Theatres on the Bay
  - Reclamation of Jurong Island Phase 3B
- 1999 - Deep Tunnel Sewerage System

2000

- 2003 - VivoCity
- 2006 - ION Orchard and the Orchard Residences
- 2007 - Reclamation for Pasir Panjang Terminal Phase 3&4
  - ArtScience Museum
- 2008 - Marina Coastal Expressway C485
- 2009 - International Cruise Terminal

2010

- 2010 - Mount Elizabeth Novena Hospital  
National University Hospital
- 2011 - MRT Downtown Line:  
Jalan Besar Station
- 2012 - Changi General Hospital
- 2013 - MRT Thomson Line:  
Woodlands North Station
- 2014 - MRT Thomson Line:  
Bright Hill Station



Reclamation of Changi International Airport



Sim Lim Square



Wheelock Place (Lane Crawford Place)



Chiltern Park Condominium



# Contributing to the Future of Singapore

In Singapore, where global economy continues to grow, infrastructure development is still continuing. The Company is also working on construction projects by demonstrating our spirit of meeting the challenge in order to further expand the potential of this country. In this section, we will introduce the "Marina Coastal Expressway C485 Project" and "Changi General Hospital Project" as recent examples.

Project 1

## Marina Coastal Expressway C485 Project

In December 2013, Marina Coastal Expressway (MCE) was opened with the aim of making large-scale improvements to the land transportation network on the south side of the Marina Bay Area, where development is progressing. This highway has a total length of 5.3km. Of this, 3.6km is underground tunnel. C485, which the Company was responsible for, is a tunnel with a total length of 700m that includes the first undersea tunnel in Singapore. We built this huge ten-lane tunnel that joins together the uplink and downlink at a depth of about 20m from the surface of the sea under design and build contract.

## Tackling Difficult Construction Cutting Off a River

There is an estuary barrage called "Marina Barrage" in the vicinity of the project, so it was necessary to pay careful attention so as not to affect the functions of this facility during construction. Furthermore, the floodgates installed in the barrage opened and the water inside is discharged during heavy rains, so we were required to ensure a discharge width of at least 150m during construction so as not to interfere with this operation. Therefore, we carried out construction in two stages: Stage 1 and Stage 2. The construction

of the tunnel was performed by constructing a cofferdam with steel pipe sheet piles. This meant it was a difficult construction project with virtually no precedent worldwide in which we poured concrete into the huge steel pipe sheet piles at a diameter of 1.4m deep underground at the bottom of the sea and then extracted these steel pipe sheet pipes after the completion of construction. We were able to complete the project on-time by using extra-large machines (e.g. the world's largest vibro-hammer) and making full use of a variety of construction methods.

## Reliability of Technology + α

At the opening ceremony of the MCE, we received a congratulatory address from the Minister of State who said, "the undersea tunnel in this project was the greatest challenge in this tunnel construction project and magnificently overcoming this difficulty has allowed us to open this highway today." Moreover, we also received high praise in terms of both our technology and health & safety environment program. We were selected three years in a row for the "Workplace Health & Safety Awards" intended for all industries in Singapore by the Ministry of Manpower and the Health & Safety Council. In addition, we were selected two years in a row for the "Safety Excellence Construction Awards" by the Land Transport Authority who placed the order for this project.





- 1 This is a rendering of "Changi General Hospital"
- 2 This is the panoramic view at the end of April 2014. We are currently constructing the framework of the rooftop from the eighth floor.
- 3 "Mount Elizabeth Novena Hospital" was our first step in hospital construction in Singapore.
- 4 "National University Hospital" has great features in its structure.
- 5 We conduct non-conformance checks that have a high degree of accuracy by utilizing BIM.

## Project 2

### Changi General Hospital Project

In Singapore, there has been continuous construction of hospitals equipped with state-of-the-art medical equipment to meet the medical needs of growing population and aging population. Changi General Hospital has been positioned as a medical facility at the core of medical care in the eastern region in the "Healthcare 2020" policy that is being promoted by the government. The construction of this hospital has given rise to the first medical facility in the country that is capable of meeting a wide range of patients - from emergency patients to patients requiring long-term care (including those undergoing rehabilitation) – by cooperating with adjacent hospitals. Furthermore, this is environment-friendly building introducing natural ventilation, a solar system and green walls, so it has been awarded the "Platinum Green Mark" by the Building and Construction Agency.

### Trust Built on Proven Results

Hospital construction is one of the fields the Company is currently focusing in Singapore. "Mount Elizabeth Novena Hospital," a project we won as a foothold in hospital construction in 2010, is the construction of a large hospital with over 300 beds on 14 floors

in a 2 ha site. Although this hospital has a total floor space of 74,000m<sup>2</sup>, we completed this in about two years. After this, following "Jurong General Hospital Underground Project," we completed in 2013, the project for the "National University Hospital" that we were awarded in 2010. This project became a topic of interest due to the construction method in which we built a framework of a mega-truss in the upper reaches of the underground station building.

### Efforts with an Eye on the Future

The government-led introduction of BIM\* in Singapore is progressing and submissions through BIM will be required in stages with construction verification applications by 2015. In this construction project, we worked on platform building and human resources development so that horizontal deployment to other projects will be possible in the future while brushing up on the practice of BIM after fully introducing BIM from the start of construction.

#### \*BIM = Building Information Modeling

This is a tool that makes it possible to share information up to the design, construction and maintenance management of buildings by using three-dimensional models. In particular, it is possible to exercise control over entire projects in large properties that include a diverse range of construction work.