

MARINE CIVIL ENGINEERING

Operations

Since its foundation in 1908, TOA has engaged in reclamation and marine construction works through various projects all over the world. Among them are reclamation works for industrial areas and offshore airports; port and harbor facilities, such as wharves and breakwaters; transportation facilities, such as coastal roads and bridges; and recreational facilities, such as marinas.

In order to complete those projects safely and successfully, TOA has developed various construction methods, working vessels, and equipment to overcome severe natural conditions on and under the sea. In addition, as lifecycle management of infrastructures, environmental sustainability, and protection from natural disasters are becoming of greater concern to

society, TOA has developed new technologies for renewal and reinforcement of structures, environmental assessment and pollution control, sub-surface and sub-ground survey, disaster prevention, and so on.

With these work achievements, advanced technologies and accumulated expertise, TOA has earned a reputation for more than a century as a reliable contractor of maritime construction and engineering. TOA will make all possible efforts to improve technologies and cultivate human resources in order to respond to growing engineering requirements and emerging concerns, and strive for the prosperity of society and sustainability of the natural environment.

Chubu Centrair International Airport

Chubu Centrair International Airport, inaugurated on February 7, 2005, is a first class airport with a 3,500m runway. It is designed to be the main international gateway to the Chubu (central) region of Japan. In order to be 24-hour operational, the airport is located in Ise Bay, 1.1km offshore of Tokoname City, Aichi Prefecture, to prevent disturbing local communities with airplane noise.

Throughout the construction of the 470ha artificial island, which commenced in November 2001, "Plug Magic" and "COS-NET," two of TOA's advanced technologies (see page 12 for details), played critical roles in building the 12km-long enclosing seawalls

and reclaiming 56,000,000m³ of soil and earth in an economical, timely, safe, and environmentally-friendly manner. "Plug Magic" recycled the soft clayey material coming from dredging operations of navigational channels in Ise Bay into construction material suitable for reclamation, and saved 8,630,000m³ of soil from having to be transported from on-land sources in the vicinity. "COS-NET" was adopted by contractors involved in the projects as a common system to monitor and control working vessels, and ensure their smooth and safe navigation around the working area.



TOA's "Plug Magic" dredging method (see page 12 for details) was adopted in order to maximize the recycling of dredged soft materials

Kansai International Airport 2nd Stage



Kansai International Airport 2nd Stage was to reclaim a new artificial 545ha island in the sea 200m off the existing island. The island was to have an average thickness of 19.5m and have a 4,000m-long runway parallel to the existing one, access ways between the two islands, and other related facilities. Development of the second island required the construction of a 13km-long seawall, reclamation of 250,000,000m³ of soil, and improvement of the 20m-26m thick alluvial clay layer under the seabed. Work commenced in August 1999 and was completed in October 2005.

TOA devoted its rich experience and advanced technologies to carry out this super-scale project in a timely, top-quality, environmentally-friendly manner. Among these technologies were the “Beluga Surveying System,” for accurate and speedy survey of the seabed formation (see page 12 for details), and the all-terrain GPS-positioning surveying buggy, for surveying wide and bumpy landforms.

Minami-Honmoku Container Terminal

The Minami-Honmoku Pier is located at the Port of Yokohama, which is one of the ports in Keihin Port, a designated strategic international container port. With the aim of strengthening its international competitiveness, work is currently underway to make improvements to the facilities at the Minami-Honmoku Pier to transform it into an international container terminal capable of enabling large-scale container ships to come alongside the quay. Columns measuring 32 meters high with a diameter of 24.5 meters constructed of steel sheet structure cellular were employed in the work to construct the earthquake-resistant quay's foundation. The quay will, in the future, have a



façade that is sunk to a depth of 20 meters. The project was started in the 2007 fiscal year and is scheduled to be completed in the 2012 fiscal year. At present, work is being carried out on MC-3, with plans calling for work to continue on MC-4.

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Sakhalin II LNG Project in the Russian Far East



Provided by Sakhalin Energy

The Russian Government invited foreign investments to develop the natural gas and oil fields offshore of Sakhalin Island in the Russian Far East in the Sea of Okhotsk. For the Sakhalin II project, TOA was awarded contracts in 2003 to construct a LNG loading facility for natural gas processing, a liquefying plant, the foundations for the oil export terminal, and to provide ready-mixed for the entire project.

TOA overcame various difficulties that hampered the smooth execution of the construction work, such as the severe weather conditions that prevented offshore work throughout the winter and oftentimes other seasons as well, the strict environmental regulations to protect fish, other marine creatures, and their habitats around the worksite, and completed the project in 2008 on schedule.

Saigon Premier Container Terminal

The Saigon Premier Container Terminal, located in the south part of Ho Chi Minh City, was constructed in the largest port in the city. This facility has a 500-meter wharf and a 23-ha container yard with a storage capacity of 16,000 TEU (20-foot equivalent container units), giving it the capability of handling containers totalling 930,000 TEU a year.

Making use of its many years of experience in construction work in the Mekong Delta region in southern Vietnam, TOA took part in the construction of this facility by undertaking measures to reinforce the soft ground in the delta region. TOA employed the cement deep mixing (CDM) method, a technology for ground improvement developed by TOA, earning high praise from the client.

The construction of such port and harbor facilities is seen as being a part of the port and harbor development projects promoted by the government of Vietnam. It is anticipated that this facility will make it possible to increase the volume of containers handled in the southern part of Vietnam.



Pasir Panjang Container Terminal in Singapore



The Port of Singapore, which is connected to 600 ports in 123 countries, is one of the largest container hub ports in the world. The Pasir Panjang Container Terminal, located in the southwest part of Singapore Island, will have a total of 26 berths at the completion of Phase I and II of the project. All container berths have been designed to have a depth of 15 meters and be equipped with gantry cranes capable of reaching out across 18 rows of containers, making it possible to accommodate Post-Panamax class container ships.

Since 2005, TOA Corporation has been awarded 6 separate contracts to construct 14 container berths with a total quay length of 4,330 meters and a carry ferry terminal. The last 4 berths, with a total quay length of 1,300 meters, were completed in October 2009.

Newly Completed Project

Tokyo International Airport Runway D Exterior Construction

- Client Kanto Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism
- Construction period .. March 2005 to August 2010
- Project outline Expansion of airport with construction of a runway that is 2,500 meters in length and 60 meters in width, as well as connecting taxiways (two taxiways, each 30 meters in width)
- Site of construction ... Ota-ward, Tokyo



Runway D, which was constructed at Tokyo International Airport (generally known as Haneda Airport) with the aim of expanding the airport's capacity to handle arriving and departing flights, was put into service in October 2010.

The new runway was built using a hybrid construction that employed a combination of an artificial island made of landfill and a pier. In this project to build the runway, TOA was responsible for constructing the embankment and landfill (Section IV), as well as the connecting section embankments and pier.

TOA's technologies in marine civil engineering were utilized in nearly every aspect of the project, including technologies for improving the soft foundation to make it stable and solid, as well as technologies for improving dredged soft sediment so it could be used as landfill material.

Works to Make Improvements (Section3) to Kobe Port Island (2nd Stage) District Quay (PC-14~17)

- Client Kinki Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism
- Construction period .. March 2010 to March 2011
- Project outline Dismantle structures, make improvements to the ground, and carry out restoration work at Kobe Port Island (2nd Stage) District Quay (PC-14 ~ 17)
- Site of construction ... Kobe City, Hyogo Prefecture



The Port of Kobe is one of Japan's main international trading ports. In 2010, the Port of Kobe joined the Port of Osaka to form Hanshin Port, which was designated as a strategic international container port. At present, work is underway to develop the Port of Kobe into an international marine terminal with the aim of strengthening its international competitiveness.

TOA carried out liquefaction countermeasure construction on the quays currently in use, so that port facilities can continue to function even if a major earthquake were to strike.