Marine Civil Engineering

Since its foundation in 1908, TOA has engaged in reclamation and marine construction works through various projects all over the world. Among them were reclamation works for industrial areas and off-shore 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 equipments 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 getting more socially concerned, TOA has developed new technologies for renewal and reinforcement of structures, environmental assessment and pollution control, sub-surface or sub-ground survey, disaster prevention, and so on.

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

Chubu Centrair International Airport

Chubu Centrair International Airport, inaugurated on February 17, 2005, is a first class airport with a 3,500m runway 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 keep local communities from airplane noise.

Throughout the construction of the 470ha artificial island commenced in November 2001, TOA's advanced technologies, "Plug Magic" and "COS-NET" (see page 12 for detail), played critical roles to build the 12km-long enclosing seawalls and reclaim 56,000,000m^3 soil and earth in an economical, timely, safe, and environment-friendly manner. "Plug Magic" recycled the soft clayey materials coming from dredging works of navigational channels in Ise Bay into the construction material suitable for reclamation, and saved 8,630,000m^3 of soil to be imported from the 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 in and around the working area for their smooth and safe navigation.

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

Kansai International Airport 2nd Stage

Kansai International Airport 2nd Stage was to reclaim a new artificial 545ha island on the sea 200m off the existing island and 19.5m deep on average, a new 4,000m-lomg runway parallel to the existing one, access ways between the two islands, and other related facilities.

Development of the second island required construction of 13km long seawall, reclamation of 250,000,000m^3 soil, and improvement of 20m-26m thick alluvial clay layer under the seabed, which was commenced in August 1999 and was completed in October 2005.

TOA devoted its rich experiences and advanced technologies to carrying out this super-scale project in a timely, quality-assuring, and environment-friendly manner. Among them were the "Beluga Surveying System" for accurate and speedy survey of the seabed formation (see page 12 for detail), and the all-terrain GPS-positioning surveying buggy for surveying wide and bumpy landform.

Yumeshima Container Terminal, Port of Osaka

In the modern era of economic globalization, ports and harbors play the key role to enhance competitiveness of the industries and prosperity of the communities in the region. In this regard, Osaka City and Japanese Government planned to build an advanced-standard container terminal on Yumeshima Island off-shore of downtown Osaka with three container berths to accommodate post-panamax class container ships.

In 1999, TOA was awarded a contract to construct a 350m-long and 15m-deep wharf structure, consisting of foundations with steel pipe piles driven through the rock foundation of the existing caisson seawall and the superstructure made of reinforced concrete. TOA made the best of its technologies and experiences for high-quality construction. For example, TOA conducted extensive studies to avoid cold joints and control cracks to place concrete over the wide quay superstructures, which resulted in excellent workmanship.

TOA was also awarded separate contracts to build the administration building, the maintenance shop building, and the gatehouse building for the terminal and successfully completed them in a timely, safe, and quality manner.

In order to secure smooth traffic between Yumeshima and the mainland, a bridge and a submerged tunnel were planned. The bridge for a six-lane road connecting Yumeshima and Maishima, named "Yume-mai Bridge", has a very unique feature. That is, a 410m-long center section of the 878m-long bridge is upheld at the both ends on the floating foundations, and is to be pivoted on one end by a tugboat when a large vessel passes under the bridge. In 1996, TOA was awarded a contract to transport and install the floating bridge built at a shipyard, and successfully completed the work.

The submerged tunnel for a four-lane road connecting Yumeshima and Sakishima, named "Yume-saki Tunnel", was opened in August 2009. The 806m-long submerged portion of the 2,138m-long tunnel consisted of eight pieces of steel-shell caissons filled with reinforced concrete, of which respective dimension was 100m long, 35.4m wide, and 8.5m high. The caissons were built at the caisson yard and then were transported to the site and accurately submerged into the channel dug on the seabed, and TOA was involved in both stages in separate contracts.

Sakhalin II LNG Project in the Russian Far East

Provided by Sakhalin Energy

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

TOA overcame various difficulties hampering smooth execution of construction works, such as the severe weather conditions which precluded off-shore works throughout the winter and frequently even in other seasons and the strict environmental regulations to protect fish, other marine creatures, and their habitats around the site, and completed the project in 2008 on schedule.

Cai Mep International Container terminal in Southern Vietnam

In 2008, the joint venture consisted of TOA Corporation as the representative partner and TOYO Construction Co., Ltd. received a new order to construct the Cai Mep International Container Terminal from the Government of Vietnam funded by an aid-loan of Japan's ODA program. The new container terminal is located approximately 50km to the south of Ho Chi Ming at the estuary of Thi Vai Cai Mep River, and will have a 600m-long 14m-deep quay accommodating two 80,000DWT-class container ships at a time and a 38ha container yard with handling capacity of 600,000 TEU to 700,000TEU of containers a year.

In the tender process, TOA's work records and advanced technologies for soil improvement works were highly appreciated because the terminal is to be constructed over the thick layers of very soft alluvial clay.

Pasir Panjang Container Terminal in Singapore

Port of Singapore, connecting 600 ports in 123 countries, has been one of the largest container hub ports in the world. The Pasir Panjang Container Terminal, located in the southwest of Singapore Island, is planned to have 26 berths in total of its phase I and II projects. All container berths are designed to have a depth of 15m and be equipped with gantry cranes outreaching 18 container rows to accommodate Post-Panamax class container ships.

Since 2005, TOA Corporation has been awarded 6 separate contracts to construct 14 container berths with total quay length of 4,330m and a car ferry terminal, and is currently engaged in constructing the last four berths with total quay length of 1,300m, which will be completed in October, 2009.

Newly Completed Projects

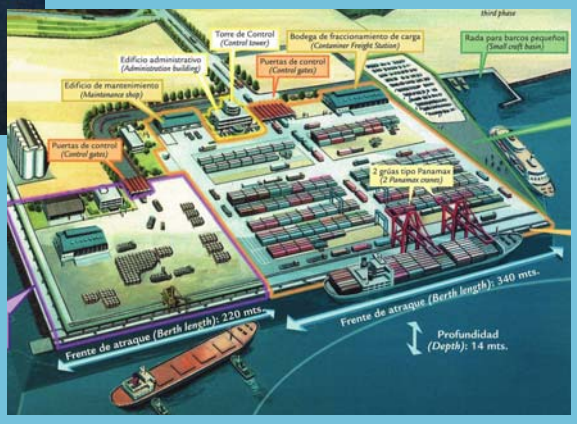
La Union Multi-purpose Port Terminal in El Salvador

In 2005, TOA Corporation was awarded a contract to develop a multipurpose port terminal in La Union City in the easternmost region of El Salvador. Funded by an aid-loan of Japan's ODA program, the project was to promote sustainable economic growth of the country and revitalize the region. TOA devoted its highest level of technologies and management skills to complete the project on schedule.

Project owner: Comisión Ejecutiva Portuaria Autonoma (CEPA), República de El Salvador

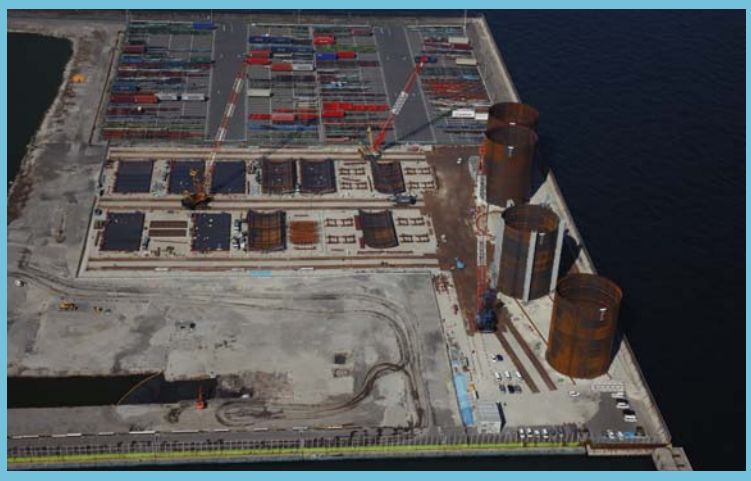
Construction period: from April 1, 2005 to December 28, 2008

Construction summary: Dredging works of 12,000,000m^3 for the navigational channels and the berthing area, reclamation works of 3,000,000m^3, construction works of a 340m-long and 15m-deep container berth, a 220m-long and 14m-deep multi-purpose berth, a 240m-long and 9.5m-deep passenger terminal berth, paved roads of 170,000m^2 in the total area, and other utility facilities.



Minami-Honmoku Container Terminal, Port of Yokohama, using Cylindrical Steel Sheet Cellular Seawall

In July 2004, Ministry of Land, Infrastructure, and Transportation started a program to develop advanced container hub ports in order to enhance competitiveness of Japanese economy and industries. The Port of Yokohama, one of the three ports designated by the program, planned to newly develop two container terminals with a depth of 20m, the deepest in Japan, at its Minami-Honmoku port district. The Steel Sheet Cellular Structure, developed by TOA, was adopted to construct the 20m-deep quay wall because it enables to shorten the construction period and provides sufficient earthquake-proof strength. TOA was awarded a contract to build six cells with ever-been-the-largest dimensions and completed them with high quality workmanship.



Project owner: Ministry of Land, Infrastructure, and Transportation of Japan

Construction period: from May 2008 to March 2009

Construction summary: 6 units of Cylindrical Cellulars, made of 17mm thick steel sheet, 32m in height and 24.5m in diameter, each weighing 400 metric ton.