

## Marine Civil Engineering

TOA was established at the beginning of 20<sup>th</sup> century, and has been engaged in the development of coastal industrial zones, starting from Tokyo Bay Area. TOA has been contributing to the formation of infrastructure, consolidation of industrial foundation and many project completions for our rich, daily life in various local areas.

Among our completed results, it includes the land development for industrial zones, construction of advanced harbor related facilities such as piers, sea berth, container terminals and warehouses, and colossal building facilities that took long-term construction period. We also provided high level of technology for the construction of airports, artificial islands, bridges and facilities including coastal plants, marina and offshore amusement spots. In the background of these completion of large but quality based marine civil engineering projects, there is the requirement for "modernization" in Japan, and we are confident that we have our specific mission and technology to realize these social needs.

In every project, we always think of the importance of harmony between man and nature. Therefore, we initially investigate and study the topography, soil conditions, water and marine sources of the site thoroughly. We then consider the human factors including culture and industries before we engage in our projects. This results in solid reputation, not only in the local societies and industries, but from local inhabitants too.

Future projects for marine civil engineering forecast that they require higher level of technology, more remarkable equipments, richer experience and environmental friendly human nature.

### Construction of the Central Japan International Airport (centrair)

The Central Japan International Airport will be a full-fledged offshore airport with a 3,500m runway. The airport operates 24-hours a day, and special consideration has been given to its facilities, systems, and operations. Terminal Buildings are now under construction to start service on February 17, 2005. A 470 hectare airport site was reclaimed using earth and sand of 56,000,000m<sup>3</sup>, 8,630,000m<sup>3</sup> of those soils are recycled materials, which were provided by effectively utilizing recycled material dredged in the Nagoya Port, in which TOA was in charge of. The PLUG MAGIC method was applied to this reclamation work, which contributed to shorten the construction period. The remaining 4,500,000m<sup>3</sup> consists of mountain soil was transported to the site from other area.



PLUG MAGIC method



### Kansai International Airport 2<sup>nd</sup> Stage



(Photo : KALD)



In this project, a 545-hectare new airport island will be built 200m off the existing island to construct a second 4,000m runway, apron and taxiway. The island will need 250,000,000m<sup>3</sup> earth and sand as it is deep as 19.5m in average at the site. The revetment work, began in July 1999, was completed in November 2001. And reclamation work is now proceeding. It is important to build a firm foundation free from any ground subsidence when preparing the ground for an airport. In order to ensure the construction of a firm foundation, TOA is utilizing various technologies and techniques for this reclamation work. One of the good examples is the use of GPS to ensure the accurate positioning and the height of reclaimed land.

### Construction of High-Standard Container Terminal in Osaka Bay

This project was planned to accommodate large containerships and those increasing container transportation that plays a major role in international logistics. Construction works of an submerged tunnel for roads and rails, which connects Yumeshima Island and downtown of Osaka to ensure smooth transportation of goods, is almost complete. Osaka city awarded TOA the contract for the basic parts of the railway of this tunnel, and we provided full execution of the tunnel section of the road and railway. TOA is also engaged in construction works of the high-standard container terminal (-15m), as part of the Osaka Bay construction project.



### The 2nd LNG Berth at Futtsu Thermal Power Station



To meet with annually increasing demand for the electric power in Tokyo Metropolitan area, it is urgent to construct the LNG (Liquefied Natural Gas) receiving facilities for the combined cycle power generation of Futtsu Thermal Power Station. TOA is engaged in the expansion works of the dolphin type LNG receiving berth.



### Road Construction in Philippines



This is a project to construct the road on the sea of the south bay in Cebu City. The road extending 4,300m on the sea was constructed by embanking sea which required the improvement of foundation. The project was completed by TOA's advanced technology of marine civil engineering, such as Paper Drain. In addition, the project includes the construction of the road extending 800m on the land.

### Semakau Island Offshore Landfill Project, Singapore

TOA completed and delivered the Semakau Island offshore landfill project to the Ministry of Environment in Singapore. Located between Semakau Island and Sekang Island, some 10km south of Singapore Mainland, this large sized waste-receiving island constituted a major construction project.

The project included embankment construction with 7km in circumference, land formation for facility administration offices, construction of an ash-unloading jetty, and construction of the administration building. This involved 20 million m<sup>3</sup> of reclamation work, 6 million m<sup>3</sup> of dredging, 2 million m<sup>3</sup> of stone riprap work and jetty extension of 580m.



### Punggol Reclamation Project (Phase 4)



Singapore is a small country and it is important to use the coastline of Peninsula effectively. Housing Development Board (HDB) of Singapore has sincerely wrestled with the development of housing land in the mouth of Punggol district with the reclamation of 11 million m<sup>3</sup> of soil, revetment construction of about 10km in length, and soil improvement works of 5.1 million m<sup>3</sup>.

TOA completed its reclamation works in the north-eastern coast of Singapore and gained Quality Award from HDB in honor of reclamation work in 2002. There will be 15 new waterfront with resident areas, recreation facilities, shopping centers and marine parks in the future.





### International Passenger Terminal at Osanbashi Pier in Yokohama port

Since its construction in 1894, Osanbashi Pier has contributed greatly to the development of Yokohama as Japan's marine gateway to the world. Nearly a century since its construction, the pier had aged, and reconstruction of the pier from its foundation began in 1988. Then between 2000 and 2002, a new international passenger terminal was built on the new pier. These new facilities will carry on the tradition and continue to serve as a gateway between Japan and the rest of the world. It has a total floor space of 43,843m<sup>2</sup> and is in good repute as berths for large ocean vessels.



## Newly Completed Projects

### South Container Terminal, Tobishima Pier

Construction of a new container terminal is underway at the southern district of Tobishima Pier in Nagoya Bay to accommodate large container ships and increasing amount of container. This container terminal provides following features; -16m berth which is the deepest in Japan, a 500m length and a huge backyard of 17.5 hectares.



### Yokohama Bay Bridge Common Area and Honmoku-Daikoku Coastal Road

Yokohama Bay Bridge Common Area and Honmoku - Daikoku Coastal Road Yokohama Bay Bridge has contributed greatly to smooth transportation, and it has become a symbol of Yokohama for its beauty. This year, TOA completed the road construction works that stretches from the Yokohama Bay Bridge to Honmoku - Daikoku coastal road. This will bring those effects such as making the container transportation more efficient between Honmoku area and the Daikoku Pier area, alleviating congestion in Yokohama urban area with fewer volumes of container traffics and improving urban environment.

