

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, 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 was adopted in order to maximize the recycling of dredged soft materials

Tokyo International Airport (Haneda Airport) (Tokyo)

Haneda Airport started in 1931 as a small nationally run airfield with a single 300-meter runway. Subsequent extensions were continuously carried out to keep pace with the continually increasing demand of the airport. To respond to this growth, Toa Corporation, too, moved forward with its state-of-the-art civil engineering technologies. A new artificial island was completed at the Haneda Airport site and put to use for the 4th runway (2,500 m).

The construction was carried out in cooperation with multiple construction companies under a variety of difficult conditions, including using a hybrid pier/reclamation construction, a structure rarely used anywhere in the world, short construction periods, and quick execution under restrictions by airlines.

Toa Corporation's technologies were applied to nearly every part of the construction of the artificial island, including improving the weak foundation soil and producing landfill material by hardening dredged soil. Furthermore, the

company dedicated itself to ensuring quality by grasping the ever-changing movements of the foundation in real-time through meticulous management of work execution that was reflected in subsequent processes.



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

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.



Provided by Sakhalin Energy

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.

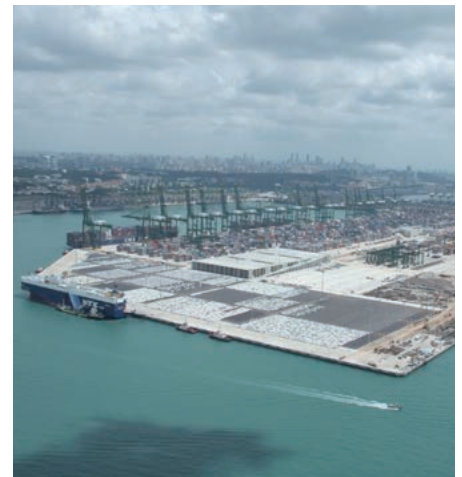
The construction of such port and harbor facilities is seen as being a part of the port and harbor development projects promoted by the government of Vietnam. It is anticipated that this facility will make it possible to increase the volume of containers handled in the southern part of Vietnam.



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

Naoetsu LNG Terminal Pier with Intake & Discharge Pipelines (Niigata Prefecture)

The Naoetsu LNG Terminal, a receiving terminal for liquefied natural gas, located in the city of Joetsu in Niigata prefecture, was completed in November 2013. This terminal is able to receive and regas 1.5million tons of LNG per year, and supply natural gas that is equivalent to the annual gas consumption of around 5 million households. TOA constructed the intake & discharge pipelines and a receiving pier, capable of docking a 210,000 m³ loading class LNG supertanker.



■ Client

INPEX Corporation

■ Construction period

March 2010 to November 2013

■ Site of construction

Joetsu City, Niigata Prefecture

■ Project outline

Design and built of pier facilities, intake and discharge pipeline, and electrical instrumentation related to construction of INPEX Corporation's Naoetsu LNG Terminal

Quay Wall Construction Work (Phase 2) at Port of Yokohama Honmoku District (depth of 16m) (to improve earthquake resistance)

Quay Wall Construction Work (Phase 2) at Port of Yokohama Honmoku District (depth of 16m) (to improve earthquake resistance) of Honmoku Pier, which is the largest container pier at the Port of Yokohama, has been completed.

The construction work is being carried out now in the Honmoku Zone of the Port of Yokohama to further improve the earthquake resistance of the facility, which has deteriorated. This work will enable the preservation of the distribution function of the facility as a transport hub in the event of a major earthquake.

■ Client

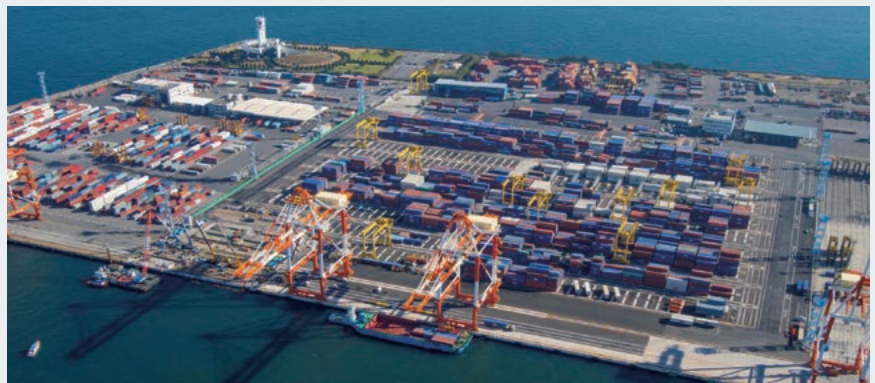
Kanto Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism

■ Construction period

March 2013 to November 2013

■ Site of construction

Yokohama City, Kanagawa Prefecture



■ Project outline

- Dismantling the upper portion of foundation of landward side crane : 97m
- Extracting steel pipe piles (diameter of 800mm; thickness of 13mm;L=17.0m to 37.0m) : 37piles
- Extracting steel pipe piles (diameter of 1000mm; thickness of 14mm; L=39.0m to 43.0m) : 21piles
- Dismantling the upper portion of temporary earth retaining structure :130m
- Dismantling the wales of temporary earth retaining structure : 68m
- Extracting steel sheet piles (SP-VL type; L=19.5m to 27.0m) : 308 sheets
- Cutting ground anchors : 34places
- Carrying out chemical grouting (suspension type) : 5,770m³
- Carrying out high-pressure injection mixing : 38,334m³