

# ON-LAND CIVIL ENGINEERING

## Operations

With a century-long history as a highly-reputed, reliable contractor in marine construction and engineering, TOA also has accumulated experience and expertise in on-land civil engineering through the completion of various projects. Among the projects are roads, bridges, railways, tunnels, water dams, river dikes and water gates, water supply and drainage systems, sewage collection and treatment facilities, land

development, and environmental mitigation and rehabilitation programs.

In each and every project, TOA has devoted all of its capabilities to faithfully execute its duties and responsibilities as a contractor, enhancing TOA's reputation as one of the most trustworthy contractors in Japan.

### Shibakawa Aqua-duct Shield Tunnel

The Shibakawa River, which flows through the Tokyo bed town of Saitama City, suffered from deteriorating water quality due to increases in domestic sewage from the growing population in its basin. As the channel slope of the Shibakawa River was too gentle for its natural flow to cope with the pollutants in the sewage, a plan was drawn up to build the Shibakawa Aqua-duct to introduce clean water from the Arakawa River, which flows west of the Shibakawa basin.

In 1999, TOA was awarded a contract to construct a shield tunnel having a total length of 2,330m and an inner diameter of 1,650mm to connect the two rivers. One of the key requirements of the contract was to recycle the shield sludge in order to minimize the adverse impact on the environment caused by the construction by-products. TOA's technical team properly responded to the requirement by developing an effective and efficient processing plant to process 5,300m<sup>3</sup> of soft and clayey shield sludge into a construction material with characteristics suitable for river embankment construction.



### 2nd Magsaysay Bridge and Butuan City Bypass Road in Mindanao, Republic of the Philippines



In the Republic of the Philippines, the road network bears 90% of the passenger traffic and 50% of the cargo transportation, but many roads in various areas are unpaved or too narrow to keep up with the growing volume of traffic. Funded by an aid-loan from Japan's ODA program, the Philippine Government planned a bypass road in Butuan City to improve traffic conditions and bolster the economy in the northeastern region of Mindanao Island.

In 2005, the Department of Public Works and Highways of the Philippines awarded a contract to

a joint venture of TOA and Nippon Steel Corporation to build the 2nd Magsaysay Bridge, a steel cable-stayed bridge with a total length of 882m, a two-lane bypass road with a total length of 8.1km, and two link roads with a length of 1.33km and 2.9km respectively to connect the bypass road with the existing main road. For this project, TOA took part in constructing the single main pylon made of reinforced concrete, the foundations to support the bridge superstructure, and all civil works for the road section.

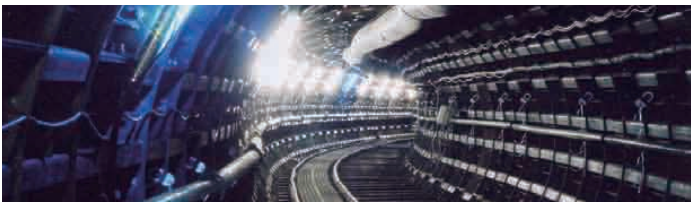


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## Rehabilitation of Sewage Drainage System in Chiyoda Ward, Tokyo

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As the sewerage network in downtown Tokyo, which was constructed nearly one century ago, has become obsolete both physically and functionally, the Tokyo Metropolitan Government started a project to rehabilitate the sewage drainage network through reconstruction and refurbishment. In 2000, TOA was awarded a contract to reconstruct the drainage system for surface runoff in Chiyoda ward. Although the construction site was along narrow streets with heavy traffic and a dense concentration of buildings, TOA's highly-qualified engineers dealt with various difficulties in the course of construction, and utilized the shield tunnel method to complete the drainage system, which measured 2,058m in length with an inner diameter of 2,200mm, on schedule without any accidents.



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## Emergency Restoration Works of Seisho Bypass Toll Road, Kanagawa Prefecture

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In September 2007, a typhoon washed away the shoreline retaining walls of the Seisho Bypass, a four-lane toll road running along the coastline of Sagami Bay in the western region of Kanagawa Prefecture. As its closure caused severe congestion on the local roads, the road administrator, Central Nippon Expressway Co., Ltd., gave TOA an emergency order to restore the damaged structures and reopen the road as soon as possible. TOA devoted all of its expertise and capabilities in marine engineering to provisionally reinforce the damaged structures, and tentatively reopened the bypass road after only 20 days. This was appreciated so much by the road administrator and the local communities that TOA was continuously engaged in the restoration work, mostly executing the work from the sea-side using various working vessels, and completing the repairs to make all four lanes traversable in April 2008.



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## Denpasar Sewerage Development Project in Indonesia

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Denpasar, the provincial capital of Bali and a world-famous tourist destination, had a serious problem as its sewerage system had become incapable of treating the growing volume of sewage discharged by local residents and tourists. In order to protect Bali's rich natural environment, the Denpasar Sewerage Development Project was established. In 2005, TOA was awarded a contract to construct a sewage treatment plant and lay a total of 47km of sewage drainage pipes under the busy streets of Denpasar. Introducing for the first time in Indonesia a method called the pipe-jacking method, which thrusts forward reinforced concrete pipes one after another using hydraulic jacks from the tail-end, TOA completed the project in 2007 with minimal inconvenience to road traffic and the local communities.

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## O Mon Thermal Power Plant Project in Vietnam

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The O Mon Thermal Power Plant in Can Tho, the biggest city in the Mekong Delta, was envisioned to generate 330MW of power to solve the growing shortage of electric power in Vietnam. As the full turn-key contractor of the project, TOA took charge of all civil and architectural works, and completed the project in 2009. TOA's expertise in geotechnical engineering was especially valuable as the soft alluvial clay layers under the plant site had to be improved to construct solid foundations. Construction summary: soil improvement work using the Cement Deep Mixing (CDM) method; pile driving works with 6,000 poles measuring 45m each; concrete works with a total volume of 100,000m<sup>3</sup>; building of a power generation facility, an administration building, and a central control building; foundation works for water treatment and other facilities; construction of a 140m-high chimney, 3 piers, water-intake facilities, and roads.