Construction project on the Namboku Route close to the Port of Tokyo

Seiji TSUJI ► General Manager (Engineer), Tokyo Port Office,
Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism

1. Summary

The Namboku road on the waterfront of the Tokyo Port is a planned trunk route beneath the sea floor 2.5 kilometers long, linking two areas in the port: the Ariake Area and the Chuo Bohatei Area (central breakwater area) (Fig.1.) In the Chuo Bohatei area of the Tokyo Port, a container terminal is under construction.

It will serve as a link between the above areas, where currently only a single existing route under the sea floor is in operation. It will be named the Tunnel for the Second Shipping Route, which passes along another route. Traffic on this route is extremely congested with delivery vehicles moving around the port area.

The traffic is predicted to grow worse along with development of the Chuo Bohatei Area.

Prior to the Tokyo Olympic/Paralympics Games 2020, 14 athletic fields and stadiums will be built in the waterfront area. During the event, it is feared that the port area will be overcrowded with delivery vehicles and Olympic-related vehicles. Considering these circumstances, we are aiming at opening the route before the Olympic Games 2020 and creating port logistics functions.

This tunnel under the sea floor will be have two lanes in each direction, and the section under the sea floor will be a series of seven immersed caissons respectively 134 meters long, the longest in the country (Fig. 2.)

2. Problems and solutions in the construction of an immersed caisson tunnel

The tunnel spans a distance of 930 meters, linking the Ariake Area and the Chuo Bohatei Area. Generally, any project of the same size will require 8 to 10 years to finish, but this tunnel must be completed within a much shorter time of 4 years.

1) Immersed caisson of fully sandwiched type

In order to streamline the construction process, the structure of the tunnel will be a fully sandwiched type with a steel-concrete composite structure. The steel hulls as caisson will be prefabricated in a dry dock, and then in an assembled state, will be transported to a location on the sea for floating. While floating, the hollow spaces of the caisson walls are filled with concrete (Fig. 3). The advantage of this procedure, in comparison with other types of immersed caissons, is as follows. Caissons are fabricated in the dry dock, thereby shortening the on-site construction period by the amount of time needed for caisson fabrication.

2) Application of the "key element method"

The caisson tunnel will be linked by placing a "key type element caisson" underwater in the final stage between the two tunnel segments coming from opposite directions (Fig. 4). This approach makes it possible to make the construction process shorter and curtail the cost, because underwater work is not required.

3) Use of flexible joints "Crown Seal"

The Crown Seal is used when joining tunnel caissons to allow for deformation in the event of an earthquake (Fig. 5).

This joint is designed to adjust for large deformations by providing a free space between the caisson segments as well as greatly reducing the stress resultant which may occur on the immersed caisson body.

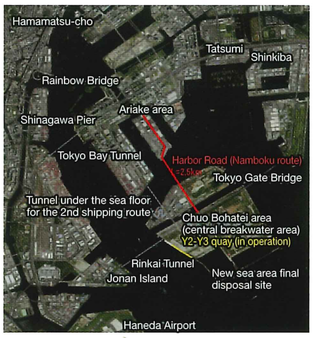

Fig. 1 Location map of Namboku Route

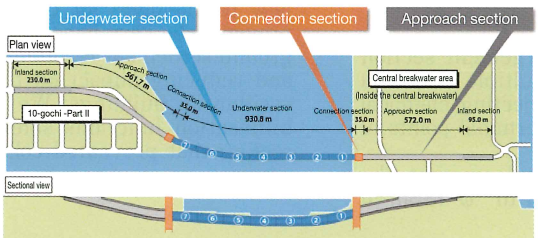

Fig. 2 Plan and sectional view of Namboku Route

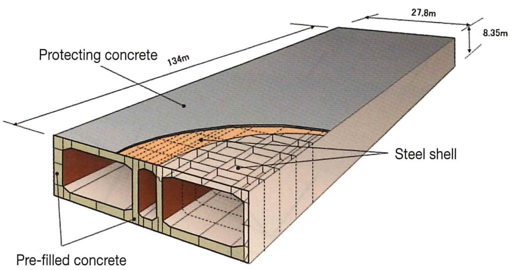

Fig. 3 Steel-concrete composite structure of Full-sandwich type

Fig. 4 Conceptual drawing of the key element method

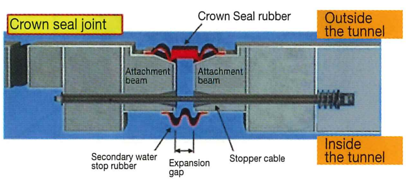

Fig. 5 Crown Seal joint