

Major Onshore and Offshore Projects in Osaka Bay Area

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ABSTRACT

Around the Osaka Bay area in western Japan, many onshore and offshore projects have been carried out, are in progress or in planning. In the first part of this paper, the ground condition of the Osaka Bay area is outlined from the geological and geotechnical viewpoint. Then, six major onshore and offshore projects in progress are selected and outlined. Finally, geotechnical topics related to waterfront developments in the Osaka Bay area are summarized and discussed.

INTRODUCTION

In Japan, the area where social activities can be carried out for a population of more than 120 million is only about 10^5 km², less than 30% of the total area. It is inevitable, therefore, that there is not enough of the necessary action space especially in such large cities as Tokyo and Osaka. Recently, intense interest has been shown in new frontier space development, such as waterfront and geofront, as underground space is called in Japan. As for the waterfront development in the Osaka Bay area, many onshore and offshore projects are in progress or in planning (Fig. 1). Osaka Bay is oval-shaped and has major and minor axes of about 60 km and 30 km, respectively. Many large-scale manmade islands, including Kansai International Airport (opened in September 1994), have been constructed, are under construction or planning, especially along the northeastern shoreline of the Bay. These manmade islands will provide more space for social activities and industrial and commercial developments in the Kansai Region, which includes the cities of Osaka, Kobe, Kyoto, Nara and Wakayama.

These reclaimed manmade islands are usually constructed on superficial soft marine clay of recent deposit, underlain by stiff to medium malleable Pleistocene clay layers sandwiching sand and gravel layers. Therefore, various geotechnical problems arise not only during the reclamation of the manmade islands but also during construction of project structures after the reclamation.

In this paper, the ground condition of the Osaka Basin is firstly outlined, together with a geotechnical database being constructed for this area, to understand the geological and geotechnical features of the ground in the Osaka Bay area. Next, six major onshore and offshore projects in progress are selected and outlined. Finally, geotechnical topics related to waterfront developments in the area are summarized and discussed.

GROUND CONDITION OF OSAKA BASIN

The ground condition of the Osaka Basin has been subjected to large crustal deformation due to plate tectonic force, and many geological research works have been carried out. Fig. 2 illustrates the outline of the Basin's topography and ground formation. A

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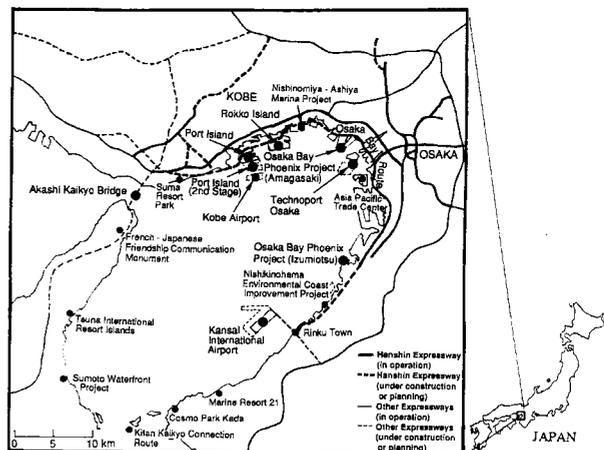


Fig. 1 Onshore and offshore projects in Osaka Bay area

geological explanation of the present ground condition based on the tectonic forces of the Pacific and Philippine Plates can be found in Hujita (1990). It is seen from Fig. 2 that three sets of faults exist in the east-west, north-south and northeast-southwest directions. In addition, there is the folding of thick sedimentary layers with a maximum total thickness of more than 1,000 m.

In Osaka Bay, the seabed ground consists of several thick layers of clay which have been identified as marine deposits. Between the clay layers are sand and gravel layers of various thicknesses. These marine clay layers are often designated as Ma followed with a number indicating the layer, from Ma0, which is the deepest marine clay, to Ma13, which is the topmost layer. Fig. 3 shows the bore-hole data of OD-1, a 900-m hole drilled in the mid-1960s from which the numbering of these marine clays was first established.

Many bore-hole data are already available. From recent research, various geological and geotechnical characteristics have been elucidated, such as the correlation of each marine clay layer based on the geological investigation of micro fossils as shown in Fig. 4, and the variation of geotechnical characteristics of each marine clay layer along the shoreline of the Bay as shown in Fig. 5 (Research Committee on Seabed Deposit in Osaka Bay, 1990a; Akai et al., 1991; Research Committee on Geotechnical Information of Osaka Bay Seabed Deposit, 1993).

To study this complicated ground condition in detail, the Japan Society of Soil Mechanics and Foundation Engineering (JSSMFE) Kansai Branch established the Research Committee on